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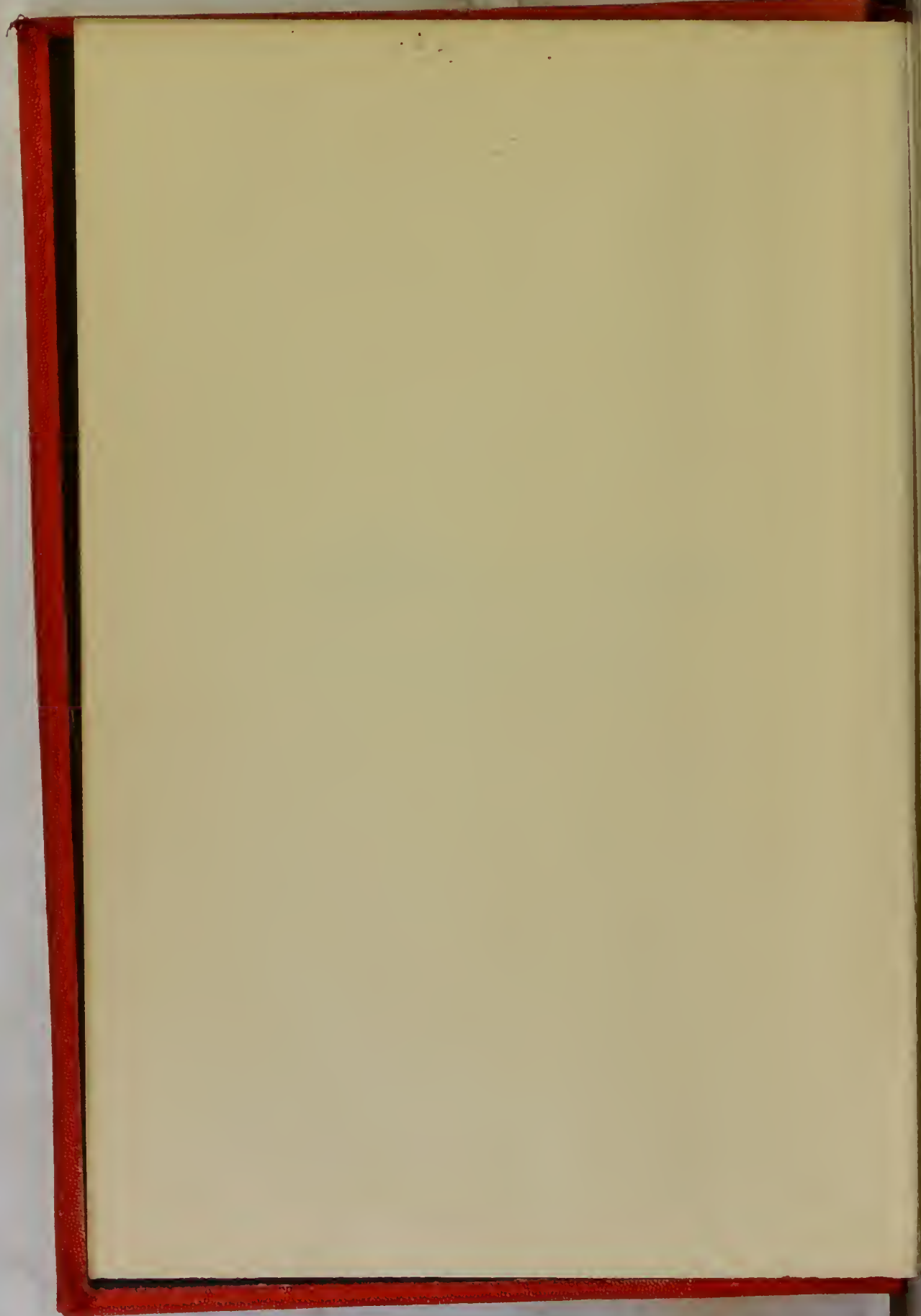
DISEASES

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DISEASES OF CHILDREN

TAYLOR AND WELLS



JUST PUBLISHED

Diseases of the Stomach

BY

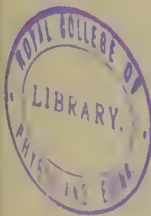
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Clinical Professor of Medicine in the University of Maryland; Consultant
to, and Director of, the Clinical Laboratory in
University Hospital, Baltimore, etc.

Diseases of the Stomach. Their Special Pathology, Diagnosis,
and Treatment. With Sections on Anatomy, Physiology,
Analysis of Stomach Contents, Dietetics, Surgery of the
Stomach, etc.

WITH COLORED AND OTHER ILLUSTRATIONS

LONDON: H. KIMPTON
82, HIGH HOLBORN, W. C.



MANUAL
OF THE
DISEASES OF CHILDREN

BY

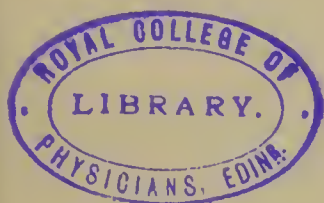
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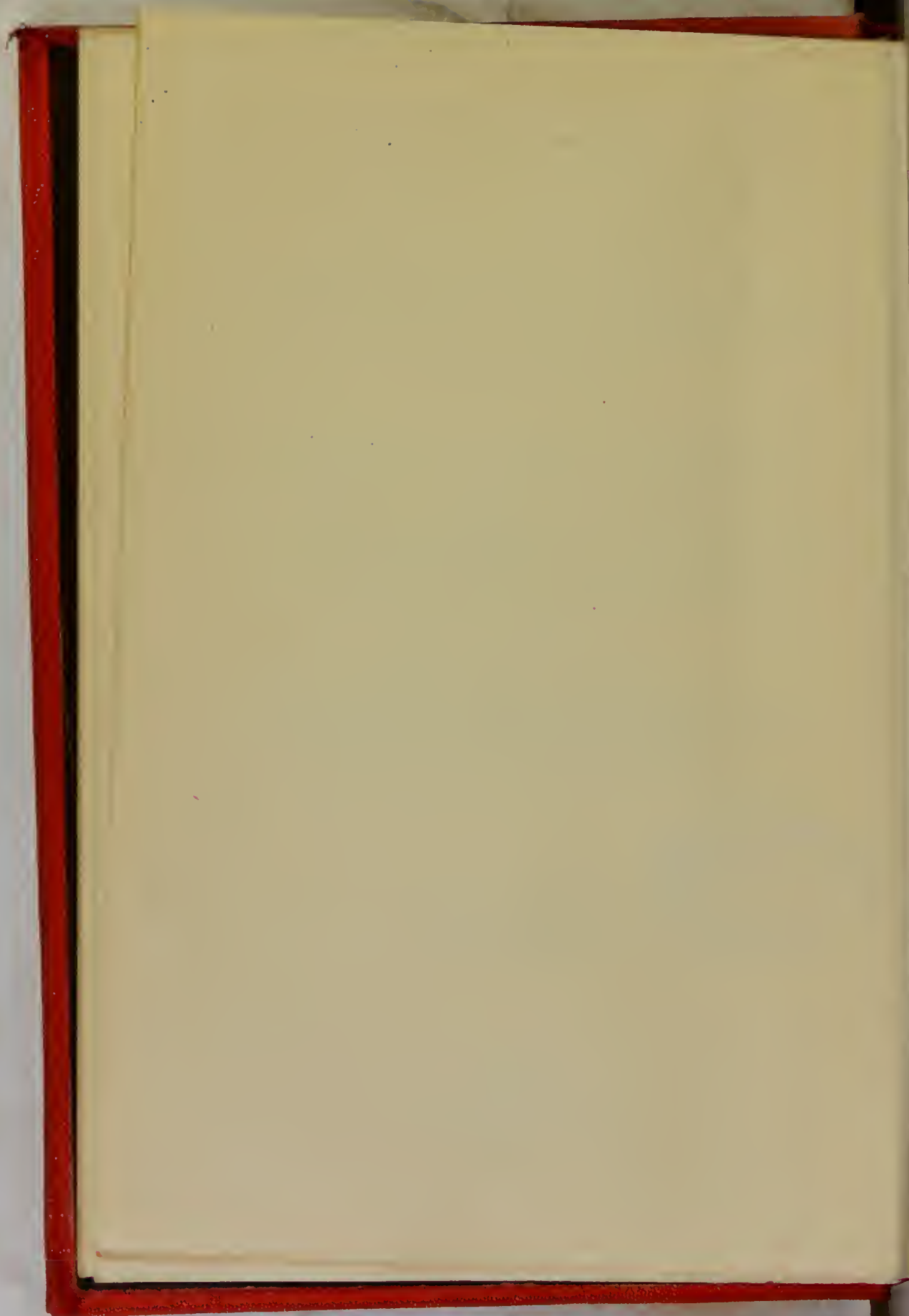
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Illustrated

LONDON
H. KIMPTON
82, HIGH HOLBORN, W. C.
1899



THIS BOOK IS RESPECTFULLY DEDICATED TO

LOUIS STARR, M.D.,

IN RECOGNITION OF THE CONSTANT AND VALUABLE STIMULUS

WHICH HE HAS ALWAYS EXERCISED ON THE PRO-

GRESS OF THIS BRANCH OF MEDICINE.

PRE

[illegible]

PREFACE.

The authors do not claim this book to be a treatise on the maladies of childhood. The original manuscript has in many cases been extensively condensed and several articles omitted so as to reduce the size of the volume to its due proportions as a practical working manual—a brief but competent guide for the student and practitioner. The aims of the authors have been to present in a clear and concise manner the chief points in the description, differentiation, and treatment of the diseases of childhood. The pathology has been abbreviated, not because this most important division of the subject is undervalued, but for the reason that in so small a work there is not sufficient room to adequately describe the constantly increasing discoveries and opinions in this direction. The treatment of the various diseases described is accorded prominence, and has in the majority of cases been dwelt on at length, though the mention of many drugs is avoided. The authors do not attempt to offer much that is original or novel, and only obtrude their individual views when commenting upon the opinions of the great masters in the field of pediatric medicine. The names of few authorities are mentioned. In the preparation of the manuscript several gentlemen have most kindly lent their aid, and to them the thanks of the authors are due. Among these are: Dr. Wm. Johnson Taylor has added much of interest from the standpoint of the surgeon; James Herbert McKee, on diseases of the heart; T. A. Erck, on diabetes, etc.; Joseph Leidy, on scurvy; Carl Seiler, A. V. Watson, and G. H. Makuen, on respiratory diseases. The authors desire also to acknowledge their indebtedness

to Dr. Van Harlingen for aid in chapter on skin diseases; to Dr. Edwin Rosenthal for his aid in the article on diphtheria and intubation; to Dr. L. S. Ferris for numerous abstracts on the literature of the diseases of the blood, the acute fevers, etc.; and to Dr. L. F. Appleman for the index.

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DISEASES OF

PHYSIOLOGY OF

MANUAL OF DISEASES OF CHILDREN.

CHAPTER I. PHYSIOLOGY OF THE INFANT AND CHILD.

The infant at birth presents certain characteristics worthy of a special description and distinct from those of childhood.

A fully developed infant is one born after a period of two hundred and eighty days' gestation. Its average length at birth is from seventeen to twenty inches, or about fifty cm., and its weight, as given by different authorities, varies from six to eight pounds (averaging about 4000 gm.). The weight of males is slightly in excess of females.

The weight of the infant and child, although subject to slight variations due to many causes, should increase in regular, definite proportion according to age. Sudden decrease in weight will almost certainly point to some fault in nutrition, the use of improper foods, or the approaching onset of some disease. It is of great importance, therefore, that the child should be weighed at regular intervals of say one or two weeks, and it is best that the weight should be taken at the same time of day and always on the same scales.

As Rotch has tersely stated, "the initial weight is doubled at five and trebled at fifteen months"; at seven years the weight is double that of one year, and at fourteen years it is double that of seven years. Not infrequently a slight decrease in weight is seen during even a normal period of dentition or when the child is being weaned. The following table will show the gain in weight in grams and pounds from birth to fourteen years:

AGE.	GRAMS.	POUNDS.	AVERAGE GAIN A DAY.	
			Grams.	Ounces.
At birth,	3,000 to 4,000	6.6 to 8.8		
From birth to five months, . .			20 to 30	$2\frac{2}{3}$ to 1
From five months to twelve months,			10 to 20	$1\frac{1}{3}$ to $2\frac{2}{3}$
At one year,	9,500	20.90		
At seven years,	19,000	41.80		
At fourteen years,	38,000	83.60		

(The above figures are on a basis of 3500 gm. (7.7 pounds) at birth, and of a gain of 30 gm. a day for the first four months and 10 gm. a day for the last eight months of the first year.)—*Quoted from Retch.*

The weight of the child should also be in proportion to its length, as will be seen by the following table:

BOYS.		AGE.	GIRLS.	
Height, Inches.	Weight, Pounds.		Height, Inches.	Weight, Pounds.
19.75	7.15	Birth.	19.25	6.93
24.75	14.30	5 months.	23.25	13.86
29.53	20.98	1 year.	29.67	19.80
33.82	30.36	2 years.	32.94	29.28
37.06	31.68	3 "	36.31	33.15
39.31	37.99	4 "	38.80	36.36
41.57	41.00	5 "	41.29	39.57
43.75	45.07	6 "	43.35	43.18
45.74	48.97	7 "	45.52	47.30
47.76	53.81	8 "	47.58	51.56
49.60	59.00	9 "	49.37	57.00
51.68	65.16	10 "	51.34	62.23
53.33	70.04	11 "	53.42	68.70
55.11	76.75	12 "	55.88	78.16
57.21	84.67	13 "	58.16	88.46
59.88	94.49	14 "	59.94	98.23

It is a curious fact that in comparing the weights of children as shown in the above table (which refers to the proportion of height to weight in American children) with those as found in the works of certain English authors, that the weight of American seems to be slightly under that of foreign children of the same height and age.

In infancy the tissues are softer and more elastic than those of the adult or even of older children. The body and limbs are well rounded by a plentiful covering of fat, giving the characteristic plumpness and roundness so familiar in the infantile form. A downy growth, known as lanugo, frequently covers the body at this time; the nails are well formed and extend to the end of the pulp of the fingers and toes. A glance at the body as a whole will at once reveal the fact that the upper part of the trunk, with the arms and head, is much larger than the lower part of the body with the exception of the abdomen. The cause of this will easily be seen when we study the changes in the circulation of the blood which follow the cessation of placental and the establishment of pulmonary circulation. It has been taught by the older writers that the general aspect—the roundness of body and limbs, the formation of the nails, the plentiful growth of hair on the head, and the attainment of the average weight—is sufficient evidence of normal development of the infant at birth. Yet observations made on a large number of infants show us that certain parts of the infant's body must attain certain definite relations to one another in regard to size, in order to show that it has attained a perfect state of development. A short rule for computing this is the following: As has been before stated, the length of the average child at birth is about 20 in., or 50 cm. If the infant is normally developed, the circumference of the thorax should measure one-half the length plus 10 (50 divided by 2 equals 25; plus 10, equals 35 cm.). Therefore 35 cm. is the circumference of the thorax in the normal infant. The circumference of the skull should equal the circumference of the thorax plus 2, or 37 cm. (50 divided by 2, plus 10, equals 35; plus 2, equals 37 cm.). This simple rule is of practical value, and has been tested by the authors in a number of cases. According to Frank, who has made a series of studies on the relative size of the head and of the shoulders of infants born at term, the girth of the shoulders is usually greater than that of the head. Where the circumference of the head falls below thirty-two cm. ($12\frac{5}{8}$ inches), the child is usually immature. The growth of the finger nails, the presence of lanugo, and the size of the epiphyses, he considers of little importance as diagnostic signs of the maturity of the fetus. Changes in the proportions given above in a majority of cases will point to some abnormality in the develop-

ment of the child or to the presence of disease ; thus, where the circumference of the head greatly exceeds its relative proportion to the thorax and length of the infant, the patient is either rachitic or, more probably, has beginning hydrocephalus. A considerable decrease in these proportions would very probably indicate microcephalus, and if the fontanelles are absent or very small, the diagnosis would be almost certain.

An examination of the trunk and extremities of the new-born infant will reveal the fact that the former is ovoid in shape with the larger end below, the greater part of this lower end being taken up by the abdomen, which at this period of life is large in proportion to the rest of the body. The reason for this will be explained when we study the proportionate size of the various abdominal organs, especially the liver, which during fetal life and infancy is of a size out of all proportion to the other abdominal organs. The pelvis and lower extremities are proportionately small and ill developed ; while the upper extremities, as has been remarked by Rotch, "appear as small, jointed outgrowths from the smaller end of the ovoid trunk."

Usually the first spontaneous act of the new-born infant is a lusty cry. By this means air is inspired into the lungs, which expand for the first time, and thus aid in establishing pulmonary respiration. When nude and lying on its back, we see the new-born infant making almost continuous movements with the legs and arms, accompanied by a certain amount of flexion and extension of the spine. These movements are probably a continuation of those made in the uterus during fetal life. When asleep, the attitude is normally one of complete repose, there being no motion except that of respiration, the type of which may vary considerably even in health.

TEMPERATURE.

At birth the rectal temperature of the infant is about 100° F., or $37\frac{1}{2}^{\circ}$ C., the axillary temperature being about two degrees lower. According to some authorities, a slight fall of two or three degrees occurs a short time after birth ; this, however, in the course of a few hours, rises to 98.5° , which is the normal temperature of the human body. Rotch gives the temperature of the new-born as follows :

At birth,	37.2° C. (99° F.)
Within an hour,	36.1° to 35.5° C. (97° to 96° F.)
In about a week,	36.8° C. (98.2° F.)

There is, however, in all cases a certain amount of variation which must be considered to be within the normal limit. This normal variation is considerably greater in infants than in adults, with the exception of the temperature ranges seen in women during the puerperal period. In premature infants or in those whose development is under the average at birth, the temperature is apt to be below the figures which have been given. Reitz and Finlayson have shown that there is a slight variation in temperature at different times in the day; the highest point being between 5 and 6 P. M., and the lowest occurring during the early morning hours, say between 4 and 5 A. M. It is of importance to remember that in young children trifling causes may often produce considerable increase in bodily heat. An example of this is seen in the fever which accompanies various slight nutritive disturbances.

CIRCULATION.

Previous to birth the circulation in the fetus is as follows: The fetal blood, separate and distinct from the maternal, flows from the placenta through the umbilical vein and enters the body at the umbilicus, passing from thence directly to the liver. At this point a division in the current takes place, part of it passing through the ductus venosus to the inferior or ascending vena cava, the remaining portion going directly into the portal vein and passing through the liver; it then enters the ascending vena cava, whence it goes into the heart at the right auricle. Here the blood currents from the superior and inferior vena cava empty, but do not unite, and instead of passing into the right ventricle, as is the case in adults, the blood is directed by the Eustachian valve into the left auricle through the opening known as the foramen ovale. Thence it passes into the left ventricle, and so into the aorta, whence it is finally distributed through the general system. The greatest amount of blood containing the most oxygen is carried by way of the carotid and subclavian arteries to the head and upper extremities; this accounts for the great development of the latter at birth. Returning from the upper

part of the body, the venous blood is carried along the superior vena cava into the right auricle, from which it passes through the tricuspid valve into the right ventricle, and thence into the pulmonary arteries in the same manner as in the adult. From the pulmonary artery a small quantity of blood is allowed to pass through the lungs, but the greatest portion of it is carried through a tube which during fetal life connects the pulmonary artery with the aorta, and which is known as the *ductus arteriosus*. By this avenue it is carried into the aorta. The amount of blood which passes directly through the pulmonary arteries into the lungs is only sufficient for their nourishment, and the return circulation then passes, as in the adult, through the pulmonary veins entering the left auricle, where it mingles with the blood, passing by way of the foramen ovale, and thus enters the aorta. Subsequently the blood, laden with the excrementitious substances of the fetus, is carried back to the placenta through the umbilical arteries. These are continuations of the right and left hypogastric arteries which arise from the internal iliac arteries. The changes in the circulation following birth and the cutting off of the placental circulation are as follows: (1) Expansion of the lungs produces by degrees a closure of the foramen ovale, thus relieving aortic pressure and producing obstruction of the ductus arteriosus, which gradually degenerates into a fibrous cord. Neither of these changes take place immediately after birth; indeed, the foramen ovale may remain open for a month and the ductus arteriosus for a considerably longer time. (2) The umbilical vein and the ductus venosus become obliterated, usually from the second to the fifth day after birth; ultimately they degenerate and become fibrous cords, the former becoming the round ligament of the liver and the latter a fibrous cord, which in the adult may be traced along the fissure of the ductus venosus. (3) The umbilical arteries change in a twofold manner: the portion between the internal iliac and the superior vesical branch, which supplies the bladder, remains pervious, while the portion between the fundus of the bladder and the umbilicus becomes obliterated,—usually from the second to the fifth day,—and continues as a fibrous cord, which forms the lateral ligaments of the bladder. (4) The Eustachian valve ceases, so far as its function is concerned, almost immediately after birth. Its remains, however, may be traced for weeks or months afterward. In the new-born infant the weight of the

blood is estimated at five per cent. ($\frac{1}{19}$ to $\frac{1}{20}$) of the entire body weight, while in the adult it is about eight per cent. ($\frac{1}{13}$) of the body weight.

HEART.

In its early stage of development the heart is so large that it occupies the greater part of the thoracic cavity. According to McClellan, it is at this time much larger, proportionately, than at any later period, or even subsequent to birth. The relative size of its cavities is also different at this time—the auricles being considerably larger than the ventricles, and the right auricle being the larger of the two. As the organ progresses in its development, we find the ventricles gradually equal and then exceed the auricles in size. The peculiarities of structure have already been dwelt upon under the head of fetal circulation; they may, however, be summed up briefly in the following: Between the right and left auricle we find an oval opening, known as the foramen ovale, which allows the passage of the blood between the two auricles; also the Eustachian valve, which directs the blood coming from the inferior vena cava through the foramen ovale.

After birth and subsequent to the commencement of pulmonary respiration with the complete establishment of the function and structure of the lung, we find these organs filling out their natural space in the thorax, and after this the heart attains nearly the proportionate size to the other organs that it does in the adult, and its position will be found, by external examination, to be very nearly the same. It is not, however, covered by the lungs to so great an extent as in the adult, and this difference is caused, partly, by the presence of the thymus gland. External examination during infancy will show that the cardiac impulse is higher and extends farther beyond the mammary line than in the adult, and that its apex beat is often obscure. We know, however, that the apex beat occupies a higher position and is further to the left side of the thorax in the infant than in the older child. Later in childhood the apex can be made out with great clearness; in fact, is often more distinct than in the adult. It is generally to be heard at the fourth, occasionally the fifth, interspace until the fourth year. An accurate examination of the valves of the heart is difficult, particularly in early childhood, partly from

the presence of the thymus and partly from the fact of the high position of the heart in the chest causing confusion of the sounds of its valves with those of respiration. It is possible, also, that the heart may change its position with the movements of the body to a greater extent in childhood than in later life.

The heart beat in the new-born infant varies from 120 to 140 pulsations a minute, girls having a slightly more rapid action than boys. According to McClellan the pulse-rates in subsequent years are as follows:

In the second year, 100 to 115 beats a minute. From the seventh to the fourteenth year, eighty to ninety beats a minute, and after that seventy-five to eighty. It must be remembered, however, that the normal rate and the rhythm may both be greatly changed by slight causes.

The weight of the heart at birth is about 20.5 gm., or about $\frac{2}{3}$ of an ounce.

LUNGS.

The apices of the lungs in children are found by external examination to occupy almost the same position as in the adult; that is, between one and two fingers' breadth above the clavicle. The vesicular sounds are most distinct below the clavicle, while the bronchial sounds are best heard in the upper region of the sternum. Owing to the encroachment of the liver upon the right side of the thorax, a considerable difference is found in the size of the spaces occupied by the right and left lung, the former (right lung) extending downward as low as the eleventh rib posteriorly, while the lower border of the latter (left lung) is found as low as the twelfth rib. Anteriorly, the right lung extends to the fourth or fifth rib, while the lower border of the left lung is found at the margin of the sixth rib. According to Northrup, the bronchial portion of the respiratory tract is, during early infancy, much more developed than the vesicular, the latter being merely small bud-like dilatations at the ends of the lesser bronchi. The connective-tissue element is found also in greater abundance than in later childhood or adolescence. The blood-vessels of the lungs are more distensible and tortuous during early childhood than in later life. The air capacity of the lungs is smaller proportionately during early infancy than in late childhood or adult life; however, we find this increasing

rapidly as age advances. According to Schnepf and Wintrich (quoted from Ashby and Wright), the vital cubic capacity at different ages is as follows :

Three to four years, about,	450 c.c.
Five to seven years, about,	900 c.c.
Eight to ten years, about,	1300 c.c.
Eleven to twelve years, about,	1800 c.c.
Thirteen to fourteen years, about,	2200 c.c.
In adults (average), about,	3300 c.c.

The absorption of oxygen, however, is relatively greater during childhood than in adult life, while the expiration of carbonic acid gas is somewhat less. In new-born infants the number of respirations varies from about forty to forty-five a minute ; from this number they slowly decrease until the third or fourth year, when they number about twenty-five to thirty. At the beginning of adolescence, or about the fifteenth or sixteenth year, they average twenty. The type of respiration in the infant is always abdominal, this being caused by the fact that during early life the diaphragm is the largest factor in the production of respiration, the ribs moving but slightly and the abdominal muscles aiding but little in the respiratory movements. Any alteration of this type of respiration is nearly always a symptom of disease in a young child. In later childhood, however, we see the chest participating in the act of respiration, the ribs being raised by the action of the other respiratory muscles or the thoracic muscles of respiration. The action of the intercostal muscles is of slight importance in man. As has been pointed out by Ebner and others, the muscles of inspiration, aside from the diaphragm, are the quadratus lumborum, the serratus posticus inferioris, the serratus posticus superioris, the levatores, the scaleni, etc. The intercostal muscles are chiefly of importance in giving rigidity to the chest. As the child approaches puberty, we see the type of respiration varying with the sexes, the abdominal and inferior costal type being found in males and the superior costal type (so-called) in females. In girls there is much less movement of the abdomen, while the greater amount of respiratory movement is seen in the upper part of the thorax. The rhythm of respiration may vary considerably in children, especially in the very young. It may, in fact, become irregular without indicating disease. The costal pleura in children is somewhat thicker

than in adults, and the inferior margin of the pleura may extend as low as the articulation of the twelfth rib (Rotch), and sometimes even as low as the transverse process of the first lumbar vertebra posteriorly.

DIAPHRAGM.

The diaphragm occupies a higher position in children than in adults, and is proportionately better developed on account of its importance as an organ of respiration. In regard to its position, Rotch, basing his opinion largely on the observations which Dwight made upon frozen sections, states that in the infant the diaphragm is to be found opposite the eighth and ninth dorsal vertebræ. On the right side it rises higher than on the left, arching over the liver. The lowest portion is that extending along the central or median line. Anteriorly, in the young child it is said to be inserted somewhat above the apex of the ensiform cartilage.

THYMUS GLAND.

This structure lies in the anterior mediastinum immediately posterior to the manubrium of the sternum. It is a long, flattened, lobulated gland, in structure resembling the salivary glands. It attains its greatest development about the second year of life, after which time it rapidly disappears. In color it is pinkish gray, and its weight, as given by McClellan, is $\frac{1}{2}$ of an ounce. It is richly supplied with blood-vessels. Its function is obscure; by some it is supposed to aid in the formation of the red blood-corpuscles. The undue enlargement of this gland may be accountable for some cases of sudden death in infants.

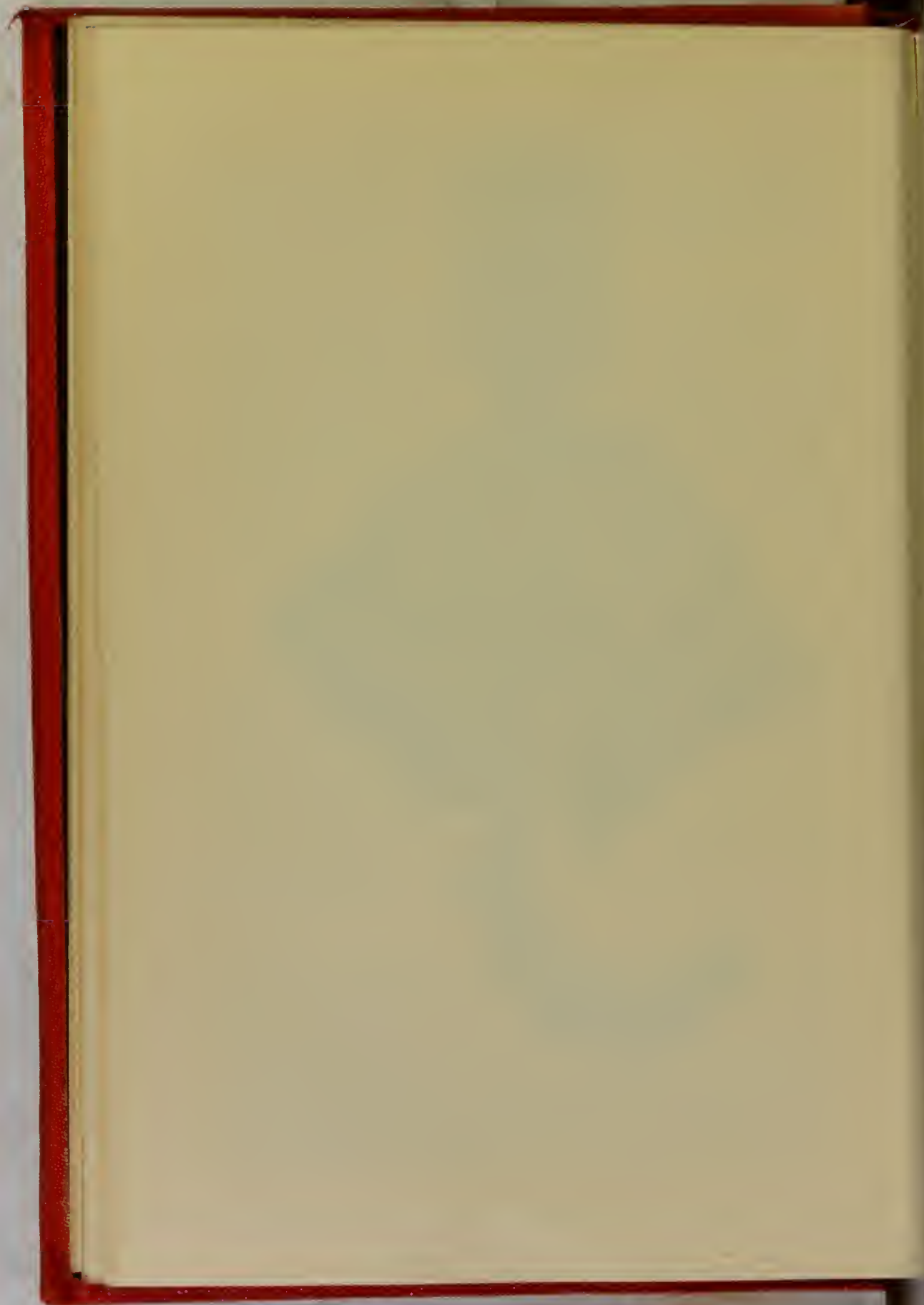
THORAX.

The thorax in the infant and young child is of much less consequence as a part of respiratory mechanism than it is in the adult. During early life it is somewhat narrower proportionately in its transverse diameter than is the thorax of the adult. According to Rotch, the average anteroposterior diameter of the interior of the adult thorax bears a relation to the transverse of 1 to $2\frac{1}{2}$ or 3. In the infant at birth this relation bears a proportion of as 2 to 3. The thorax is also shorter proportionately from above downward in the



FIG. 1.—DISSECTION OF A NEW-BORN INFANT SHOWING THE SIZE AND POSITION OF THE THYMUS GLAND AND ITS RELATION TO THE LUNGS.

A. Thyroid gland. B. Thymus gland. C, C. Lungs. D. Esophagus. E. Stomach.
Natural size. Dissection made by Dr. F. S. Ferris from a case in his own practice.



infant than in the adult. The sternum in the young child is placed higher than in the adult, the top of the manubrium being on a level with the first dorsal vertebra in the child, while in the adult it reaches to between the second and third. In children with rickets, the manubrium not infrequently reaches as high as the thyroid cartilages, as in a case seen in Dr. Taylor's clinic. The shortness of the neck so produced may have important bearing on the operation of tracheotomy and other surgical procedures about the neck. The shape of the sternum during early childhood is said to approach more nearly that of the female than the male. The ribs, too, are more nearly horizontal and form a larger part of the lateral walls of the thorax during childhood than in adult life. In quite a number of cases a certain amount of variability may be found in the development of the thorax. Especially is this the case in the measurement of the two sides, the circumference of the right side often being greater than that of the left.

The ribs of the child are flatter and more elastic than are those of the adult, but, owing to the inferior development of the inspiratory muscles, are raised but slightly during respiration, unless the breathing is forced. As has been already pointed out, respiration in the child is chiefly accomplished by the action of the diaphragm, so that the movement of the thorax is comparatively small. The bones of the thorax are subject to various deformities, caused by the influence of disease. Thus, in rickets we may have a formation of bony protuberances at the junction of the ribs and the costal cartilages, or from extreme softness of the structure there arises a narrowing of the chest with a protuberance of the sternum, causing the deformity known as *pigeon breast*.

ABDOMEN.

The abdomen of the child is more protuberant and is of a larger size relatively than that of the adult, owing, chiefly, to the greater size of the liver during early life. This organ, as has already been explained, occupies almost the entire right side of the abdomen, and, according to McClellan, has a relative weight to the whole body at birth of about one to eight. Its lower border, with the child in the upright posture, reaches nearly to the crest of the ilium, and its left lobe extends across to the costal cartilages of the left lower ribs.

In the middle line the liver is in close relation to the skin in front of the stomach, and reaches half way between the ensiform cartilage and the umbilicus. Its lower edge corresponds to a line drawn from the ninth costal cartilage on the right side, to the eighth costal cartilage on the left (Quain).

SPLEEN.

In the child the spleen can be outlined externally on the left side in the neighborhood of the tenth and eleventh ribs, at which point it is nearest the surface of the body. It must be remembered that the diaphragm always intervenes between the abdominal wall and the spleen itself. In examining the organ, percussion may prove of little value, as a distended splenic flexure of the colon may seriously interfere with our study. Auscultatory percussion will here render efficient service, however, and where the spleen can be felt beneath the costal border we may safely say it is enlarged. The size of the spleen is said to vary greatly, according to the state of nutrition, being much larger in well-nourished children than in those affected by wasting conditions. An exception to this will appear in the malnutrition due to syphilis, in which case the spleen is frequently enlarged. The size of the spleen is increased during and after digestion, at which time it contains a large amount of blood. It is covered and sustained by the peritoneum. In front of it is the stomach and splenic flexure of the colon. When enlarged, it is said that the spleen in childhood encroaches more upon the thoracic cavity than in the adult, this being caused by the greater resistance of the costocolic fold of the peritoneum upon which it rests.

PANCREAS.

Although the pancreas is formed about the second month of intra-uterine life, the starch-digesting (amylolytic) action of the pancreatic secretion is not perfected until about the fourth or fifth month after birth. The fat-digesting properties, however, are fairly well developed at birth. This has an important bearing on the question of the proper articles of food to be used in early infancy.

The situation of the pancreas is in front of the first lumbar vertebra, behind the stomach, and corresponds with a point about a hand's breadth above the umbilicus.

KIDNEYS.

In new-born infants and young children the kidneys are relatively larger in size and are situated lower than in adults. The latter peculiarity may be explained when we know that the lumbar part of the spine is at birth relatively small. The kidneys lie behind the peritoneum in a considerable quantity of fatty tissue, which helps to hold them in position. Owing to the large size of the liver, the right kidney is situated lower than the left. The kidney in children is more lobulated than in the adult, and the suprarenal capsules are much larger—indeed, in young infants they sometimes almost cover the kidney.

During the first year or two of life the kidneys attain nearly the same position and relations as in the adult.

The *bladder* in the child is practically an abdominal organ. When distended it occupies nearly the whole of the lower portion of the abdomen, and this is an important fact to be remembered in making an examination of the abdominal organs of a child. Before such an examination, the bladder must always be emptied.

The shape of the bladder is ovoid, with the larger end resting in the pelvis. As the pelvis increases in size, the bladder becomes more and more accommodated within its cavity, finally becoming one of the pelvic organs. In the child the peritoneum is reflected entirely over the posterior surface of the bladder, and extends to behind the urachus downward to the neck of the bladder, and thence to the upper part of the rectum. The anterior surface of the bladder is always covered by peritoneum. The bladder is capable of great distention, cases have been reported where the summit of the organ has reached the umbilicus, and even extended to the ensiform cartilage.* The *prostatic gland* is very small during early life.

The *quantity of urine* secreted increases rapidly for the first five days after birth. From that time the increase is slow. The average amount excreted by a child of four or five days is about twelve to fifteen ounces, averaging 420 c.c. At two years of age the daily excretion will average fifteen ounces, or 500 c.c., and at four years eighteen

* In a case reported by Dr. J. M. Taylor the upper surface of the organ reached as high as the diaphragm.

to twenty ounces, averaging about 600 c. c. The specific gravity at birth is relatively lower; this will, however, vary considerably with the amount of water the child is allowed to drink. It is curious to note that in the kidneys at birth there is often a peculiar reddish discoloration of the papilla which is caused by the presence of uric acid crystals and urates. It would seem as if this deposit was particularly marked in those children who have not had a normal supply of oxygen at birth. During early life the urine may be turbid and dark, but later it becomes clear and of a light yellow color. The excretion of urea is relatively less in children, and the same is also true of the chlorids and phosphates. The specific gravity will average in childhood from 1005 to 1010. Occasionally traces of albumen may be found in the urine during the first few days of life, but these will soon disappear.

STOMACH.

The stomach is placed more vertically in the infant than in the adult; in fact, its axis is more nearly vertical than horizontal or transverse. Its shape at birth is more tubular than in later childhood or in the adult. As is well known, the cardiac orifice of the fully developed adult stomach is protected by a valve, which prevents the regurgitation of fluids into the esophagus. In infants, however, this valvular constriction is deficient, and it is owing to this fact, in conjunction with the vertical position of the organ, which tends greatly to aid the regurgitation of fluid after the stomach of the infant is filled. Indeed, this is nature's way of relieving overdistention. About the middle of the first year of life the stomach is relatively broader than at any later period; the fundus is, at this time, but slightly developed. The capacity of the stomach at birth is very small, nearly all authorities giving it as being less than one ounce. The size and capacity of the organ seem to vary somewhat with the weight of the child. Rotch states that the gastric capacity at birth is about $\frac{5}{8}$ of an ounce, or twenty-five c.c. It is, however, capable of great distention, and curiously enough it has been found that the stomachs of babies fed continuously on artificial food have a greater capacity at any given age than those fed by the breast. On the other hand, it seems probable that the use of too small quantities of food has a tendency to cause contraction of the stomach, thereby decreasing its capacity. Following birth the growth of the stomach is quite rapid for the first three months of life. This is followed by a

period of about two months in which the increase in the gastric capacity is slight. After this time, however, there is a regular and steady increase in size until adult life is attained. Rotch, in his text-book on pediatrics, has given a table showing the gastric capacity of the child at various ages. This may be tabulated as follows:

3 hours old, capacity $\frac{5}{8}$ -1 oz.	25-30 c.c.
4 weeks old, " $2\frac{1}{2}$ "	75 "
8 weeks old, " $3\frac{1}{2}$ "	96 "
12 weeks old, " $3\frac{1}{3}$ "	100 "
16 weeks old, " 3.56 "	107 "
20 weeks old, " 3.6 "	108 "

An accurate knowledge of the capacity of the stomach of infants is of great practical value in aiding the physician to carefully regulate the quantity of food which should be given. As the experience of those interested in the scientific feeding of infants increases, the necessity for such accurate knowledge becomes of more and more importance. The table given below, which is quoted from Rotch, shows how closely in a large number of cases, the amount of food prescribed agreed with the actual gastric capacity of the infants, the ages of whom ranged from birth to eleven months. The dangers which may follow overdistention of the infantile stomach are much greater than where the quantity of food given is slightly under the actual gastric capacity.

TABLE SHOWING AMOUNT OF FOOD GIVEN TO 341 * INFANTS AT THE MILK LABORATORY, BOSTON, MASS.

AGE.	NUMBER OF CASES FOR EACH AGE.	AVERAGE AMOUNT OF FOOD AT EACH FEEDING.	
		Oz.	C.c.
Birth,	45	0.98	29.4
4 weeks,	76	2.35	70.5
8 "	84	3.22	96.6
12 "	97	3.96	118.8
16 "	87	4.57	137.0
20 "	86	5.28	158.4
6 months,	73	5.71	171.3
7 "	56	6.18	185.4
8 "	54	6.95	208.5
9 "	45	7.54	226.2
10 "	33	7.89	238.8
11 "	28	8.07	242.0

* In this table the same infant has been recorded a number of times, hence the apparent discrepancy in the total of the second column.

SMALL INTESTINE.

The average length of the small intestine in the infant at birth is nine and a half feet. According to Rotch's measurement it is 287 cm., although he states that he has seen a variation of sixty-one cm., or about two feet. During the first month of life this increase in length is about the same, but after that time its growth is irregular. During childhood the upper part of the small intestine usually occupies the left iliac fossa, while the lower part is found in the iliac fossa of the right side. In the first part of the duodenum the glands of Brunner are placed, while in the portion below the duodenum the patches of Peyer can be found, often at a very early period.

LARGE INTESTINE.

At birth, according to Treves, the large intestine measures about one foot, ten inches, or fifty-six cm. in length. Rotch states that there is very little variation in these measurements—not more, in his experience, than five inches, or 12.7 cm. It is generally taught that there is comparatively little increase in length in the first three or four months of life, but during this time the whole intestine grows more rapidly than does the sigmoid flexure, which at birth forms about one-half the entire length of the large intestine—indeed, it is stated that the sigmoid flexure actually diminishes in size owing to a readjustment of the mesentery (McClellan). Treves states that at the end of the first year the large intestine measures two feet, six inches, or 76 cm. in length; at six years about three feet, or 91.5 cm., while at thirteen years its length will be three feet, six inches, or 107 cm. The course of the colon is from the right iliac fossa upward to the liver, from which point the bowel passes transversely in somewhat of an arch across the abdomen to the spleen, forming, as it curves, the hepatic flexure, the splenic flexure, and the sigmoid flexure, the latter curve occurring in the left iliac fossa. Beyond this point it terminates in the rectum. Not infrequently its course may lie diagonally across the abdomen, from the hepatic region to the left groin. In children the transverse colon when distended with gas or fecal matter can be quite clearly outlined by percussion.

CECUM.

The cecum occupies a higher position in the child than it does in the adult, and is also somewhat shorter in the former than in the latter. In thirty out of thirty-five cases examined by Rotch, the position of the cecum varied from the right lumbar region to the lower part of the right iliac fossa. It is completely invested by peritoneum except on its posterior surface. As to whether or not the peritoneum covers the latter site authorities differ: thus Treves, in his Hunterian Lectures, states that in 100 observations he always found the peritoneum infolding the cecum on its posterior surface, and Dwight (quoted by Rotch) found that out of thirty-seven young children the cecum was completely covered with peritoneum in thirty-three cases and in the other four cases the largest part of the posterior surface of the cecum was invested by peritoneum. It is stated that during childhood the cecum is much more movable than in adult life.

VERMIFORM APPENDIX.

The position of the vermiform appendix is usually behind the cecum, with its course directed upward and outward. Externally, it can be diagnosticated in case of operation by incising in the semilunar line upon the right side at a point midway between the umbilicus and ileum (McClellan). In children it can be sometimes outlined by rectal or recto-abdominal palpation, in cases where it is swollen. Great variation in the length and course of the vermiform appendix is frequently seen. It may be wholly or partially covered with peritoneum, the length of the attachments of which may vary considerably.

SIGMOID FLEXURE.

The sigmoid flexure consists of a good-sized loop of the large intestine, which occupies the left iliac fossa, although it is occasionally found in the pelvis; the mesenteric attachment here is relatively broad, allowing of quite a considerable amount of movement. The point at which the sigmoid flexure of the colon becomes the rectum is of interest from a surgical standpoint, because it is at this point that stricture of the colon is most apt to occur. This is probably due to

the arrangement of the bands of peritoneum, the so-called sigmoid mesocolon, which bind the loops of bowel so closely together that twisting on their axes may readily occur.

The lower portion of the large intestine, known as the rectum, is straighter in childhood than during adult life. This is in part due to the straightness of the sacrum at this time. The peritoneum is reflected over the upper portion of the rectum in the same manner as in the adult, except that in the child it is lower down; the attachments between the rectum and the surrounding parts do not extend as high in children as in adults.

INTESTINAL DISCHARGES.

Following birth, the first discharge from the intestines is of a dark-brown or greenish-brown color, which, from its resemblance to the inspissated juice of the poppy, is called meconium. This substance is odorless, has a somewhat acid reaction, and is composed of partly digested amniotic fluid, cells, cholesterin crystals, and sometimes the constituents of bile. During infancy, while the child is fed on a milk diet, the intestinal discharges are of a light yellow color and of liquid consistency, containing about eighty-five per cent. of water. They are feebly acid in reaction and contain fat, traces of bilirubin, intestinal epithelial cells, lime salts, and bacteria. The amount of intestinal discharge during the first few days of life will average from one to two ounces, and the number varies from about two to five a day. As the child advances in age the number of bowel movements become gradually fewer, until the average attains about that of adult life—namely, one or two in twenty-four hours. In color, the feces do not change in health until the child begins to take starchy food, when the brown color appears. The bacteria which are found in the intestinal discharges vary in number and species; many varieties have not yet been isolated; however, the *Proteus vulgaris*, the *Bacillus lactis aerogenes*, and Brieger's bacillus may any or all be found. When the infant begins to take a mixed diet, various forms of bacilli appear; among them the *Streptococcus coli gracilis* and others (Rotch). The color of the fecal discharges varies slightly in health, depending, to a certain extent, upon the character of the food. Certain medicinal agents, especially bismuth, will darken the color of

the bowel movements. The color of the fecal discharge is changed greatly in disease; thus, we have the characteristic clay-colored discharges seen in certain forms of intestinal disease or in pathologic conditions wherein the bile is not poured into the intestinal tract; the green-colored stool, found in the majority of forms of acute intestinal infections of moderate severity; and the peculiar watery discharge mixed with shreds of mucus—the “rice water” passage of acute milk infection.

THE HEAD.

The average circumference of the head at birth, the measurement being taken on a level with the middle of the forehead in front and the occipital protuberance behind, is about thirteen to fifteen inches, or thirty-four to thirty-seven cm. The longest diameter measures at birth about 11.2 inches.

These measurements will, as has been before stated, bear a certain relation to the measurement of the thorax and abdomen, and also to the entire length of the child at term. The shape and contour of the head and general topographic anatomy differ widely from that of the adult. Thus we see that the cranial bones during early life are softer and capable of much greater compression than at a later period of development. Between the two divisions of the frontal bones anteriorly and also between the superior borders of the parietal bones posteriorly, we find an opening caused by the lack of osseous deposit in the bones which form the boundaries of the space. This space is covered by skin and periosteum, and is known as the “anterior fontanel.” The situation of this space usually corresponds with the junction of the sagittal and coronal sutures. Posteriorly, at the junction of the sagittal and lambdoidal sutures is a smaller fontanel, known as the “posterior fontanel.” The posterior fontanel usually closes soon after birth, the anterior one remaining open until about the end of the second year, or more accurately about the twentieth month. The size of the anterior fontanel at birth is about $1\frac{3}{4}$ by $1\frac{1}{4}$ inches, four by three cm. According to some authorities, the anterior fontanel increases in size from birth up to about the ninth month, after which it slowly grows smaller. Occasionally supernumerary bones, called Wormian bones, which may vary considerably in number and size, are found in the sutures between the bones of the skull or sometimes within the

fontanels. Their most frequent site is in the course of the lambdoid suture or in the posterior fontanel; they are rarely found in the anterior fontanel. The level of the scalp covering the fontanels is usually about the same or very slightly below that covering the skull generally; this, however, is greatly modified in disease. The pulsations of the cranial circulation can be distinctly felt at the anterior fontanel. The relation which the size of the face bears to that of the cranium is vastly different in the infant from that which we see in adult life. In the infant and during early life the face is much smaller in proportion to the size of the cranium than later. According to Froriep (as quoted by Rotch), the proportion between the size of the face and that of the cranium at birth is 1 to 8, while in the adult it is 1 to 2. While the height of the orbit bears nearly the same proportion to that of the skull during infancy that it does in adult life, the combined spaces of the two orbits equal nearly half the size of the face in infancy, while in the adult they equal slightly less than one-third. The lower border of the nasal opening is, during infancy, a little below the lowest point of the orbit, while in the adult it is very much below. The breadth of the skull, measured between the most distant parts of the zygomatic arches, bears a relation to the height of the face of about the proportion as 10 is to 4, this proportion being much less in the adult. In infancy the lower jaw is nearly on the same plane as the mastoid process of the temporal bone, and the upper border of the zygoma is on a level with the floor of the nasal cavity. In the adult the upper border of the zygoma is at or near the level of the floor of the orbit (Rotch). The gums of the new-born infant do not meet. A lateral aspect of the skull of the new-born will show that the auditorium meatus is situated at a point about the center of a line drawn along its inferior margin, while in the adult it is decidedly posterior to the center of this line. In infants and children the skin of the scalp is thicker than that of any other part of the body, and is closely adherent to the aponeurosis of the occipitofrontalis muscle. The pericranium is but lightly attached to the bones of the skull, being intimately blended at the sutures with the membrane between the soft bones of the child's head; it is lax and admits of extravasations of blood beneath it, producing what is known as cephalhematoma.

The relation between the development of the head and thorax is ex-

ceedingly interesting. The circumference of the head, which is thirty-seven cm., or fifteen inches, exceeds that of the thorax, the latter being thirty-five cm., or fourteen inches. In the majority of cases this excess in the size of the head continues throughout the entire first year. During this time, however, the thorax increases in size at a more rapid rate proportionately than does the head, until at the beginning of the second year we find the circumference of the thorax slightly in excess of that of the head, and from this time on the thoracic circumference continues greater than the cranial. The table given below, which is quoted from the published lectures of Professor Rotch, of Harvard, shows the proportionate sizes of the head and thorax from birth to the thirteenth year.

These were taken from male children.

AGE.	HEAD.	THORAX.
At birth,	37 cm. (15 inches).	35 cm. (14 inches).
2 years, . . .	48 " (19 ").	51 " (20 $\frac{1}{8}$ ").
3 " . . .	51 " (20 $\frac{1}{8}$ ").	55 " (21 $\frac{3}{4}$ ").
4 " . . .	53 " (21 ").	54 " (21 $\frac{1}{4}$ ").
5 " . . .	53 " (21 ").	54 " (21 $\frac{3}{4}$ ").
6 " . . .	52 " (20 $\frac{1}{2}$ ").	55 " (21 $\frac{3}{4}$ ").
7 " . . .	54 " (21 $\frac{1}{4}$ ").	54 " (21 $\frac{1}{4}$ ").
8 " . . .	53 " (21 ").	59 " (23 $\frac{1}{8}$ ").
9 " . . .	54 " (21 $\frac{1}{4}$ ").	61 " (24 ").
10 " . . .	53 " (21 ").	62 " (24 $\frac{1}{2}$ ").
11 " . . .	56 " (22 $\frac{1}{8}$ ").	63 " (24 $\frac{3}{4}$ ").
12 " . . .	53.5 " (21 $\frac{1}{8}$ ").	63 " (24 $\frac{3}{4}$ ").
13 " . . .	54 " (21 $\frac{1}{4}$ ").	66 " (26 ").

BRAIN.

At birth the dura mater is closely adherent to the skull; in fact, so intimately are they connected that extravasations can not take place between them. In the subarachnoid space is found a larger amount of fluid during infancy and throughout childhood than in adult life; the quantity of fluid present is generally just about sufficient to comfortably fill the space. McClellan (quoting from Hilton) states that hydrocephalus due to an excessive amount of fluid in the ventricles of the brain may be caused by a closure of a small opening in the pia mater which is found at the inferior boundary of the fourth ventricle,

and which is known as the foramen Magendie. The blood-vessels of the pia mater are so exceedingly delicate that high blood pressure, traumatisms, etc., may readily cause hemorrhage into the subarachnoid space; and from this cause monoplegia, hemiplegia, or diplegia may result. During fetal life and, indeed, from birth up to the seventh year, the growth and development of the brain are very rapid, but after the seventh year the growth, although steady, is slow. Cellular multiplication in the cortex of the brain ceases at the third month of fetal life. At birth the weight of the brain is one-third that of the adult encephalon. At the seventh or eighth years the adult size and weight are practically obtained, though there may be a slight increase in both up to the twenty-fifth year. This rapid attainment of weight is due to the relatively greater amount of medullary matter in the child's brain; subsequent growth is represented by an increase in the thickness of the cortex and in the size of the cortical constituents, as has been pointed out by Boyd, Veirordt, and Bischoff. At birth the brains of male and female children are practically the same size, but subsequently the brain of the male grows much more rapidly than does that of the female.

One of the most important points of external difference between the brains of the child and the adult is that the fissure of Sylvius, in its relation to the sphenoparietal and squamous sutures, occupies a higher position in childhood than in later life. Both Symington and McClellan found, in a large number of examinations and dissections of frozen sections of the brains of children of various ages under seven years, that the Sylvian fissure was always above the squamous suture, and was covered by the parietal bone. The position of the fissure of Rolando is about the same in the child as in the adult. According to Huschker, the cerebellum is much smaller as compared to the cerebrum at birth than later in life. The convolutions of the brain in the infant are slightly more shallow and have a much less complex arrangement than in the adult. The depressions or sulci between the convolutions are not so deep in early as in later life. The highly specialized centers of the brain are apparently not fully developed in the young infant.

SIGHT.

From an anatomic standpoint, the eye is fully developed at birth and is sensitive to light. There is no capacity, however, to interpret the images received by it. Apparently, the infant can distinguish light from darkness at a very early age. According to Preyer, the movements of the eyes are not co-ordinated during early infancy.

HEARING.

Apparently, the sensation of hearing is not fully developed at birth. It has been stated that this is possibly due to the absence of air from the tympanum and to a swollen condition of its mucous membrane. The senses of *touch*, *taste*, and *smell* are probably quite well developed at birth.

LACRIMAL GLANDS.

At birth the lacrimal glands are not fully developed; during early infancy the child does not shed tears. The sebaceous glands are fully formed at this time. Although it is generally claimed that the sweat-glands are only in a state of partial development, yet cases have been recorded in which infants have been seen to perspire when but one week old. Rotch states that he has seen this occur in a premature infant at seventh months.

SALIVARY GLANDS.

The secretion of saliva is not fully established in the new-born infant, and in consequence of this we find the mucous membrane of the mouth quite dry. The starch-digesting function of the saliva is very slightly present, if present at all, at birth.

CHAPTER II.

DISEASES OCCURRING AT OR NEAR BIRTH.

ASPHYXIA NEONATORUM.

Synonyms.—APPARENT DEATH OF THE NEW-BORN; ASPHYXIE DES NOUVEAUX-NÉS; ASPHYXIA PALLIDA NEUROSA.

Definition.—Deficient oxygenation of the fetal blood.

Causes.—Asphyxia in the new-born may be divided into (1) antepartum, or intra-uterine, asphyxia and (2) postpartum, or asphyxia occurring immediately after birth. The *causes of antepartum asphyxia* are: Partial or complete detachment of the placenta; interference with placental circulation, such as would be caused by pressure on the umbilical cord, or by the cord being tightly drawn about the child's body or neck; considerable nervous depression in the mother; loss of blood; continued compression of the fetal skull by the maternal parts; premature attempts at respiration by the fetus and consequent inspiration of the amniotic fluid or the secretions of the birth canal. If attempts at respiration during the child's passage along the birth canal are vigorous and prolonged, there may result a species of catarrhal pneumonia, known as "inspiration pneumonia," which may come on a few hours after birth and will probably prove fatal.

Postpartum and Extra-uterine Causes.—The most common cause of asphyxia following birth is imperfect development of the child. This may arise from the fact that the fetus is immature, the respiratory function on this account being so feeble that it can not freely inspire air in sufficient amount to inflate the lungs, thus leaving areas of pulmonary vesicles in an unexpanded condition.

This condition of deficient pulmonary expansion is known as atelectasis. The bony walls of the thorax may be too soft to allow

of expansion through muscular action. Simple weakness alone in the child may be a cause of asphyxia following birth.

Disease affecting, by mechanical pressure, the respiratory apparatus, or structural changes in the latter, may be causes. We may also see asphyxia arising from syphilitic disease of the liver or lungs, or from pressure produced by dropsy or tumors.

Asphyxia following prolonged birth pressure may be caused by hemorrhage into the fourth ventricle or into the substance of the medulla, thus producing pressure on the respiratory centers. In other cases we may see hemorrhages into the lungs themselves producing postpartum asphyxia.

Asphyxia of the new-born may be divided into three grades :

1. A slight suspension of respiration, due to an accumulation of mucus or a foreign body in any part of the respiratory tract.
2. There may be observed a type of asphyxia known as the livid, sthenic, or apoplectic form, seen in robust and full-blooded infants.
3. A condition in which the child is pale, limp, and apparently lifeless, and which is known as pallid, asthenic, or anemic asphyxia.

Pathology.—Postmortem examination will reveal patches of extravasation and ecchymoses in various organs, particularly the brain, meninges, and liver. The lungs are dark in color, firmer than when normal, and engorged with blood. The air-passages are more or less filled with mucus, amniotic fluid, and meconium, where attempts at intra-uterine inspiration have been made.

The cerebral sinuses are engorged with blood, and there is some edema of the membranes covering the brain.

In extra-uterine asphyxia the markings or alterations in the shape of the head will often be seen where pressure has been the cause.

In the lungs on postmortem examination areas of unexpanded vesicles will frequently be found. The veins and the right division of the heart are distended. In the head, congestion of the cerebral sinuses and meninges, or hemorrhages into the latter, may be present.

Symptoms.—The symptoms of intra-uterine asphyxia can only be determined by close observation of the child while in the womb. On auscultation a very slow or very rapid pulse will indicate either pneumogastric irritation or paralysis.

As the asphyxia continues, muscular spasms and unusual movements of the child may be observed. A practical point to be gained from

the above symptoms is that the movements and heart beat of the child should be carefully examined before deciding on operative or other methods of delivery. When the umbilical cord is tightly wound about the child's neck or arm a bruit, synchronous or slightly slower than the fetal pulse, can be heard by auscultation over the mother's abdomen.

Antepartum asphyxia may be suspected whenever a fetal heart beat previously regular becomes either very rapid or very slow and faint, or when, by vaginal examination, the pulsations of the umbilical cord weaken or cease, or meconium is passed by the fetus.

The symptoms of postpartum asphyxia vary considerably in the sthenic and asthenic forms. In the *sthenic*, or livid, variety, the cutaneous surfaces are cyanotic, the face is dusky or blue in color, the muscles are more or less rigid, and the eye-balls prominent with the conjunctivæ injected.

The pulsations of the cord are strong and full, the respirations intermittent, and reflexes may be excited by irritation. In the *asthenic form*, the child frequently shows evidences of deficient general development; the cutaneous surface is pale and cool, the muscular system in a state of relaxation, the lower jaw often hanging loosely down. The umbilical and the infant's cardiac pulsation are both weak. Slight, if any, movements will follow irritation of the reflexes.

Prognosis.—If auscultation for five minutes fails to reveal any heart beats, the case is hopeless; otherwise efforts at resuscitation should be continued as long as any action of the heart can be detected. An unfavorable symptom is the continued weakening of the heart and lowering of temperature notwithstanding all treatment. It must be borne in mind in the prognosis that the dangers of asphyxia are not over with the immediate preservation of life, as the child may later perish from inspiration pneumonia, or the effects of cerebral compression or hemorrhage, or a condition of permanent idiocy or paralysis may result.

Treatment.—The treatment of asphyxia in the new-born is divided into prophylactic and curative.

The *prophylactic treatment* consists of avoiding, so far as possible, impediment to the fetal circulation by the correction of faulty presentation, the judicious use of forceps, or, where the child can not be saved by these means, the decision upon suitable operative procedures for its delivery.

Curative Treatment.—Where a moderate degree of asphyxia is present, the feet of the child should be grasped firmly, and in such a manner as to prevent its slipping from the physician's hands, and the head allowed to hang downward, in order that the blood may gravitate toward the brain. While the infant is in this position, the nurse



FIG. 2.—SCHULTZE'S METHOD (INSPIRATION).

should quickly mop the mouth and upper part of the throat with a piece of soft rag wet with hot water, in order to remove any mucus which may obstruct the air-passages.

The next procedure consists of placing the child in a hot bath at a temperature of about 100° F. (37.8° C.), and pouring or dashing a thin

stream of cold water upon the chest or back ; slapping the buttocks with a towel wet with cold water is often useful.

If these methods are not successful, the mucus or fluids obstructing the air-passages should be removed by suction through a soft india-rubber catheter passed into the trachea. Irritation applied to the



FIG. 3.—SCHULTZE'S METHOD (EXPIRATION).

skin, or blowing air over the child by means of a bellows or fan, occasionally do good.

If the child still fails to respond, a soft catheter should be passed into the larynx and the lungs inflated, or the same result may be brought about by Richardson's bellows.

Where a greater degree of asphyxia exists, any one or all successively of the following manipulations should be used: *Schultze's method* (see Figs. 2 and 3): The physician standing with the body slightly bent forward and the legs moderately separated, the arms extending toward the ground, seizes the infant by the axilla in such a manner that his index-fingers are passed from behind forward, the back of the infant being toward the operator. The thumbs rest gently over the clavicles, against the posterior surface of which the remaining fingers are applied in a direction from above downward.

The infant's head is supported against the operator's wrists, who, while thus holding it, quickly raises the infant forward and upward until the operator's arms are somewhat above the horizontal line; the infant's body is now in a state of extreme extension, and inspiration is produced thereby.

At the moment when the operator's arms are somewhat above the horizontal, the motion is suddenly stopped, thus allowing the infant's body to flex upon itself in front of the operator's face. This movement flexes the infant's spine and compresses the thorax and abdomen, thus producing expiration.

The infant is now returned to the first position and the manipulations repeated at about the rate of from eighteen to twenty times a minute.

Sylvester's Method.—Place the infant on its back with a small rolled towel between the shoulders, so as to extend the abdomen and thorax. Now grasp the arms above the elbows and bring them quickly upward by the side of the head, at the same time everting them. Next bring them down again against the sides of the chest and make gentle but firm pressure. The movements should be repeated at intervals corresponding with those of normal respiration.

Laborde's Method.—This consists of laying the child on a flat surface with a small rolled towel between its shoulders. It is generally recommended that the head and neck be in the state of considerable extension. The tongue is seized with a pair of hemostatic or other small forceps and drawn out and in with a rhythmic motion, the frequency of which should correspond with those of normal respirations. It is recommended that this traction of the tongue be supplemented by motions of the arms, as in Sylvester's method.

Another method of artificial respiration, and one which the authors

have found very useful, consists of grasping the child by the buttocks with the left hand, holding it in such a position that the head will be lower than the body, the thumb and forefinger of the right hand being placed around the neck. The left hand then raises the body, bending



FIG. 4.—SYLVESTER'S METHOD (EXPIRATION).



FIG. 5.—SYLVESTER'S METHOD (INSPIRATION).

the latter over, and during this movement the thumb and first finger of the right hand are making pressure against the thorax; this constitutes expiration. The second movement consists of extending the body or straightening it out, the thumb and first finger of the right hand at

the same time releasing their pressure upon the chest wall; this constitutes the act of inspiration. The arms may be allowed to hang down, or, better, may be partially supported by the other fingers of the right hand and the body of the operator. It is well to



FIG. 6.—ARTIFICIAL RESPIRATION (INSPIRATION).



FIG. 7.—ARTIFICIAL RESPIRATION (EXPIRATION).

have the lap covered with a blanket or a rubber sheet in order to protect the clothes. The movement should be repeated from eighteen to twenty times a minute. The faradic current is also very useful in many of these cases.

Mouth-to-mouth Insufflation.—The air-passages of the child having been cleansed of mucus, the physician places his mouth to that of the child and expires with some force into its air-passages. At the end of each expiration (the child's inspiration) pressure is made on the child's thorax and abdomen, so as to cause the infant to force the air from its lungs. It is unnecessary to close the child's nostrils during its inspiration. Direct insufflation can sometimes be made by passing a soft catheter into the larynx and gently inflating the lungs, either by expiring into them or by the use of the apparatus of Depaue or Ribmont.

In cases of late asphyxia following non-expansion of the lungs, our efforts should be directed toward exciting more active respiration.

The stupor which sometimes appears is to be treated by application of hot and cold water to the head and body; some authorities recommend for this purpose the application of stimulating liniments to the chest.



FIG. 5.—RIBMONT'S TUBE.

It must be remembered that the dangers of asphyxia, particularly of the asthenic form, do not, in many cases, end with the resuscitation of the child, and means must be used for maintaining the infant's life until complete expansion of the lungs has taken place and the infant has gained sufficient vitality to continue successfully its struggle for existence. In many of these cases one or two hot mustard baths are beneficial at the beginning of life, and the authors have frequently seen very good results follow this form of stimulation and the pouring of hot water, 110° F. (43.3° C.), on the chest while methods of artificial respiration were being used.

Undoubtedly the indications in these cases are two: heat and frequent regular feeding in small quantities. Heat at a regulated temperature of from 86° F. to 96° F. (30° to 35.6° C.) can be obtained by wrapping the child in raw cotton or wool and placing it in a padded basket near the fire or with one or two bottles of hot water near it

and a bath thermometer inserted near the body. A better method is to place it in the couveuse, the one designed by Auvaré or one of its modifications being about the most convenient. The apparatus consists of a glass-covered box, in which a small basket or pillow is placed upon a false bottom on which the infant lies. Warm air is generated beneath the false bottom by means of cans filled with hot water. The air, admitted at a small door beneath the false bottom at one end

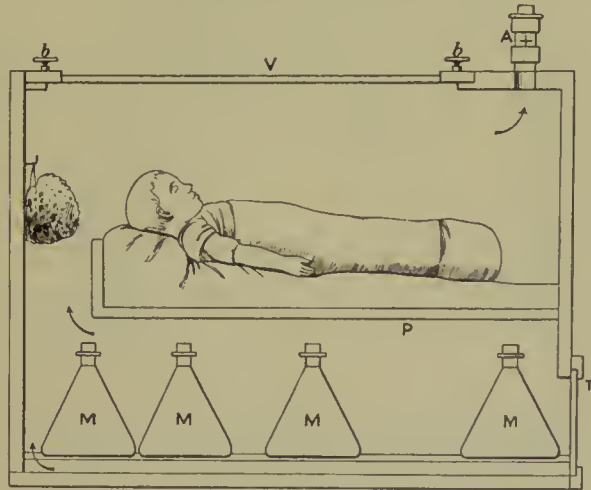


FIG. 9.—DIAGRAM OF TARNIER COUVEUSE.

of the box, is heated by its passage over the cans filled with hot water, then passes up through the chamber in which the child lies, and passes out through a tube in the top. In this tube a small revolving fan is sometimes placed to secure better ventilation.

MANAGEMENT OF INFANTS PREMATURELY BORN.

Gavage consists of feeding the infant by means of a soft rubber catheter of No. 12 or 14 size. The tube should be carefully inserted into the esophagus, guided by the finger, and so passed into the stomach, and through this the child is fed with milk pumped from the mother's breast or with from $\frac{1}{2}$ of an ounce to an ounce of equal parts of milk and warm boiled water to which a small quantity of sugar of milk or cane-sugar may advantageously be added. Partial predigestion of the milk is often necessary.

Where the child is very feeble it may be fed by passing a curved medicine dropper back into the pharynx and dropping about a teaspoonful of the foregoing milk mixture at intervals of every two hours. It should not be forgotten that even these feeble infants require water



FIG. 10.—MODIFICATION OF TARNIER COUVEUSE, IN USE IN THE JEFFERSON MATERNITY, PHILADELPHIA.

to drink, and this must be given them in quantities of a dram or so every three or four hours. In many cases water thus given will act as a stimulant. It should always be carefully sterilized and given hot. Many cases make better progress if five or six drops of good brandy be put into the water for the first few days.

DISEASES OF THE NEWBORN

HEMORRHOIDS IN

Causes.—Hemorrhoids are caused by a variety of factors, including constipation, straining, and a general debility of the system.

It is a common case, and is usually attended by considerable suffering. The patient is often unable to sit or stand, and the hemorrhoids may become very large and painful.

Symptoms.—The patient complains of a burning or itching sensation in the rectum, and may notice a protrusion of the hemorrhoids from the anus.

Definition.—Hemorrhoids are dilated veins of the rectum and anus, which may be internal or external.

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DISEASES IN THE NEW-BORN CHARACTERIZED
BY HEMORRHAGE.

HEMORRHAGES IN THE NEW-BORN.

Causes.—Hemorrhage in early life may, as in the adult, depend upon an alteration in the condition of the blood itself or upon direct injury to the blood-vessels.

As instances of the first, we have the extensive disintegration of the blood found in syphilitic infants and after the acute fevers, such as typhus, scarlet fever, etc.

Intra-uterine infection of the fetus by micrococci may be a cause of hemorrhage.

Hemorrhages from the navel following infection are also instances of this class. Tavel and Quervian have reported a case in which death on the thirteenth day after birth followed an infection of the umbilicus occurring immediately after the child was born. Postmortem examination in this case showed hemorrhages into the connective tissue, beneath the epidermis, the mucous and serous membranes, and in the kidneys. Direct evidences proved these hemorrhages to be caused by streptococcus infection.

In a second case, death occurred from pneumonia, which was the result of staphylococcus infection, as was proved by subsequent examination. The hemorrhages had occurred into the parenchyma of all the organs examined.

Symptoms.—The symptoms in the majority of cases of hemorrhage are very obscure. The infant usually ceases to nurse, is somnolent and pale. Later, convulsions and irregular respirations develop, and the child dies. A proper study of these cases can be completed only by making a postmortem examination of all infants dying of obscure symptoms.

APOPLEXY IN THE NEW-BORN.

Synonyms.—CEREBRAL OR MENINGEAL HEMORRHAGE; ASPHYXIA RUBRA SEU APOPLECTICA; HYPERÆMIA CEREBRI TRAUMATICA.

Definition.—Cerebral hemorrhage occurring in early life. The term is, however, often used to cover all degrees of increased cerebral blood pressure.

Causes.—The most frequent cause is pressure during birth or continued compression of the head by forceps. It may, however, follow pressure on the umbilical cord during a breech presentation, or otherwise prolonged labors.

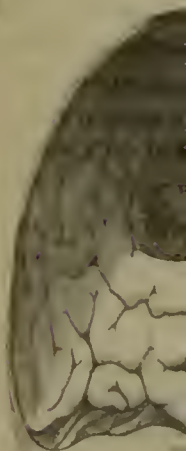
Apoplexy in the new-born is most generally the result of a venous congestion of the vessels of the pia mater or choroid plexus.

Pathology.—Following distention of the cerebral sinuses by asphyxia or other causes, or a rupture in the capillary vessels of the pia mater, the blood is effused into the subarachnoid space. As in the very young the connection between the inner covering of the brain and the cerebral tissue is not intimate, the area of hemorrhage may extend over a large surface or burst into the subdural space, compressing the brain substance; indeed, an actual laceration of the brain tissue may occur, leading to a secondary softening. Engorgement of the superficial cerebral veins may take place; as, according to Gowers, the ascending arteries pass into the ascending veins, and these empty themselves into the superior longitudinal sinus in a forward direction and consequently against the blood current.

Spencer and McNutt have concluded that while in most cases apoplexy in the new-born is seen in children delivered after difficult labors or where the forceps has been used, it sometimes occurs after short and easy labors and one of the writers has recorded a case in which an infant born in breech presentation and by an easy labor presented the following symptoms: Shortly after birth the breathing became irregular, and, later, difficulty in swallowing, convulsions, left-sided hemiplegia, and rapid emaciation made their appearance.

The length of the child's life was twenty-two days. At the autopsy it was found that a clot covered the right hemisphere, this clot being gelatinous and firm and of a dark color. Not only the convolutions beneath it were in part destroyed, especially in the frontal and parietal regions, but also the brain tissue covering the ventricle, while the site of the corpus striatum and optic thalamus were occupied by a reddish-brown clot mixed with softened brain substance.

The blood may be extravasated in points here and there over the entire brain or may only occupy a part of the organ. In other cases extravasation may take place in one or perhaps two of the cavities in the same manner as in ordinary apoplexy. In the first form there is little laceration or injury to the brain substance. The cerebral



Symptoms.—

tissue surrounding the hemorrhagic points sometimes preserves the normal appearance, being white and firm. Occasionally, however, it may present a reddish or yellowish appearance, being softened to a depth of a line or two. Where the hemorrhage occurs into a cavity, in the same manner as apoplexy of adults, the nerve-fibers are generally torn and separated. In these cases there is sure to be more or less compression of the surrounding brain substance. Unless the disease be of long standing, the cavity contains a dark, soft clot, bathed with serum. The brain substance in the immediate vicinity is softened.

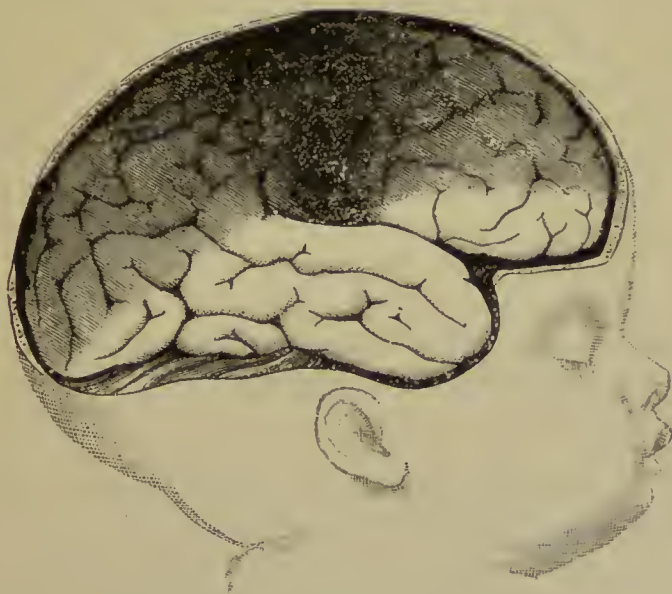


FIG. 11.—MENINGEAL HEMORRHAGE IN AN INFANT; DEATH ON THE TWENTY-SECOND DAY.—(After McNutt.)

Partial or complete asphyxia will cause intense congestion and engorgement of the cerebral vessels, being accompanied or followed by hemorrhage on or into the brain tissue in many instances, and as a result there will frequently be found a chronic meningo-encephalitis, a sclerosis, or an atrophy of a part of the brain, which in a certain percentage of cases may be followed by chronic paralysis or deficient mental development.

Symptoms.—The infant, which at the moment of birth may evince no particular symptoms, in a few hours becomes cyanosed. More or

less projection of the eyeballs may be present and the tongue possibly be protruded. If the hemorrhage is at the base of the brain or is severe, the cardiac action and respirations become weak and irregular, and the child dies from collapse. If the effusion is small or is in the cortex, or if simple hyperemia without rupture is present, the child may recover. It should not, however, be forgotten that permanent paralysis, convulsions, or even idiocy may follow such a condition.

Davis, in the "American Text-book of Diseases of Children," cites a case occurring in his hospital service, where an infant delivered with axis traction forceps without difficulty displayed symptoms of progressive feebleness of respiration. Failure to nurse and apparent exhaustion caused death in thirty-six hours after birth. A postmortem examination showed the tissues of the scalp to be intensely congested, but no gross lesion, either rupture or fracture, were present. The cortex of the cerebrum was filled with punctate hemorrhages, and over the point of greatest convexity the brain substance was materially softened. Virchow and others have shown that the blood-vessels of the infant's brain are thin and small, and most readily injured by abnormal pressure.

Treatment.—The indications for treatment are mostly prophylactic, and care should be taken to prevent excessive pressure by premature deliverance of the child by forceps or suitable operative procedure. As one author has aptly stated, there is much more danger in the continued pressure on the child's head by the maternal parts during a long labor than by a skilful forceps delivery. On the other hand, undue pressure on the fetal head by the forceps or the forcible rotation of the same should be avoided. After cerebral hemorrhage has occurred but little can be done for the patient except to keep the infant as quiet as possible and relieve symptoms as they arise.

HEMORRHAGES FROM MUCOUS SURFACES.

Causes.—Hemorrhages from various mucous membranes of newborn infants result most frequently from malnutrition and its consequent anemia, or from hemophilia. They may also be caused by congestion of the pelvic organs due to the sudden cessation of the flow of blood through the umbilical arteries.

The most common site of such hemorrhages is from the mucous

membrane of the vagina in female infants, although it may occasionally occur from the rectum or mouth, and, rarely, from the nose.

Pathology.—A careful examination of the mucous membranes of a child suffering from hemorrhages following anemia was made recently at the Jefferson Maternity, Philadelphia. This case has been reported by Davis.

The examination of the blood of this patient, as compared with that of a healthy infant taken as a standard, was as follows :

The anemic infant showed 2,000,000 red and 12,000 white corpuscles per cubic millimeter. The proportion of white to red was as 1 is to 166. Hemoglobin, thirty-five per cent. of normal. By a careful examination no blood-plates could be found. In this case the red corpuscles were irregular, crenated, granular, and many disintegrated. By actual count, this specimen would give over 5,000,000 red corpuscles per cubic millimeter, but the number of normal corpuscles was only about 2,000,000.

The author observes, the object of the count being to ascertain the number of oxygen carriers per cubic millimeter, it would give an erroneous idea to enumerate disintegrated and diseased corpuscles. The number of white cells was in this case slightly increased, but their appearance was normal.

The blood of a healthy child, which was taken as comparison, showed 5,450,000 red corpuscles per cubic millimeter. The white corpuscles in the same count showed 11,000, and the proportion of white to red was here as 1 is to 495. Hemoglobin, sixty-five per cent. of normal. The number of blood-plates was in this case considerably below normal.

While there was some irregularity in the size and shape of the red blood-cells, their appearance was that of normal corpuscles and the percentage of hemoglobin was nearly normal. The percentage of hemoglobin is not so great in children as in adults. In the former, or in any case where growth is rapid, the red corpuscles are irregular in appearance, which is not indicative of disease.

Treatment.—Where the hemorrhage is the result of simple congestion in a robust, hearty child, no treatment is required. Where the infant is anemic, it is well to employ minute doses of arsenic, careful regulation of the nursing, and inunctions of olive or cod-liver

oil, combined with soap liniment in the proportion of about three parts of the former to one part of the latter.

Where the bleeding surface can be reached, applications of a solution of boric acid or a hot mixture of creolin and water, one dram to the quart, are useful.

Where the hemorrhage is the result of simple congestion or anemia, the prognosis is good.

CAPUT SUCCEDANEUM.

Synonyms.—SUPPLEMENTARY HEAD; SPURIOUS CEPHALHEMATOMA; SUBAPONEUROTIC CEPHALHEMATOMA; KOPFGESCHWULST.

Definition.—A tumor upon the presenting part of the fetus, the result of serosanguineous infiltration under the skin and subcutaneous tissue due to pressure.

The tumor occurs upon that portion of the presenting part of the child which is itself not subjected to pressure.

The size of a caput succedaneum increases generally in proportion to the length of the labor. The color of the tumor is bluish-red and there is no fluctuation or pitting on pressure.

Causes.—Continued pressure upon that portion of the fetal skull which receives the greatest impact of force during descent and rotation temporarily checks the free circulation of the blood and lymph through the tissues of the scalp and fascia. On the opposite side of the vertex there remains a portion of the scalp which endures less pressure from the bony pelvis, and it is here that the blood and lymph of the scalp are prevented from circulating through the other side of the fetal head by pressure, and thus accumulate, distending the tissues of the side least pressed upon. Consequently, we find the tumor generally on the side opposite to that which is actually engaged in the pelvis in the first stage of labor.

The *situation* of the caput succedaneum will sometimes give a clue to the position occupied by the child in the uterus; thus, in the case of an infant occupying a position with the vertex to the right anterior half of the mother's pelvis and the fetal back to the mother's right, the caput succedaneum will be found on the left parietal portion of the child's head.

In shoulder presentation the tumor is found on the presenting shoulder.

Varieties and Pathology.—In cases in which the labor is very protracted and the head subjected to long-continued pressure, the caput succedaneum may cover *both* parietal bones, and this fact is regarded as one of the diagnostic features between it and true cephal-hematoma.

Occasionally two tumors, a primary and a secondary, may be found, and in such cases the first tumor is formed in the manner previously described and the second is due to pressure after the head is rotated on the floor of the pelvis, the presenting part being detained for a considerable time in this position.

Treatment.—In the majority of cases, caput succedaneum needs no treatment. When the tumor is very large, some stimulating evaporating lotion, such as solutions of chlorid of ammonia, camphor and alcohol, or cold cream, may be applied on cotton, which should be held in place by a firm bandage. As a rule, the tumor need occasion no further solicitude.

If the tumor persists, some authorities advise either aspiration or incision, after which pressure, by means of a pad of salicylated cotton and a bandage, should be applied. If, as sometimes happens, the tumor becomes infected and an abscess forms, it should be opened under strict antiseptic precautions and treated in the usual way.

CEPHALHEMATOMA.

Synonyms.—THROMBUS NEONATORUM; ECCHYMOA CEPHALÆMATOME.

Definition.—An elastic, non-fluctuating tumor of hemispheric form, occurring usually on the scalp and increasing in size after birth.

Causes.—The causes of cephalhematoma are obscure, and the literature of the subject contains many conflicting statements regarding its etiology.

According to Ashby and Wright, the cause is due in part to asphyxia, during which there is increased tension in the cranial veins and an altered condition of the blood allowing extravasations.

Pressure would seem in some cases to be a cause, as might be inferred from the situation of the tumor—namely, on the right parietal bone; but the literature of the subject contains the reports of a number of cases in which the tumor occurred upon parts which had not been subjected to pressure during birth, and one case is recorded in

which the tumor was seen on the head of a child delivered after Cesarean section.

Virchow believes that the pericranium is formed by a proliferation of the inner layers of the periosteum. When separation of the latter from the bone by an extravasation of blood occurs, the bone-producing layers of the periosteum are still formed but are prevented by the blood-clot from uniting with that portion of the bone for which they are intended; they therefore join themselves to the bone at the border of the extravasated clot where the bone is yet attached.

The cause of cephalhematoma has also been ascribed to traumatism and to alteration in the blood itself, this alteration being due to malnutrition.

Regarding the frequency of cephalhematoma, it is found more often in males than in females. It occurs about once in every 200 births.

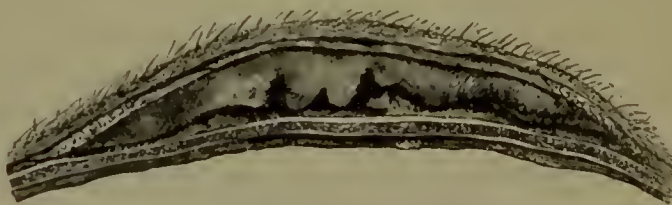


FIG. 12.—SECTION OF CEPHALHEMATOMA.

Hennig noted that it was situated fifty-seven times over the right parietal bone, thirty-seven times over the left, and in twenty-one cases it was found over both; in seven cases it was over the occipital bone, three times it was noticed over the frontal, and twice over the temporal (Ashby and Wright).

Cephalhematoma never extends beyond the borders of the bone upon which it is situated.

Symptoms.—The tumor usually appears on the third or fourth day after birth. In appearance it presents no discoloration of the surface and is without fluctuation. In size it varies from that of a walnut to that of a hen's egg. Usually there is no discoloration of the scalp around its borders. Little or no sensitiveness exists in the tumor.

The swelling usually remains about a week after its appearance. For the first few days it continues to increase in size and then slowly diminishes.

A few days after its development a distinct and well-defined ridge will be found at its circumference, this ridge being due to deposits of bone made by the periosteum.

Examination of this ridge may give the impression that a defect exists in the bone upon which the tumor occurs, and that the tumor is protruding through a perforation in the cranium.

After the decrease and disappearance of the tumor, the bony ridge may remain for a time but finally disappears, leaving no trace behind.

Pathology.—While, as has been before stated, the usual situation of the tumor is on the right parietal bone, several observers report a fair number of cases in which the cephalhematoma was found on the left parietal bone.

Hofmohl observed it to be bilateral in twenty-six cases, and in each of these the fontanel lay between the tumors as a deep sulcus. Regarding the classification of cephalhematoma, writers differ; thus, Ashby and Wright classify under this head several forms of tumor, both within and without the skull, these tumors containing an effusion of blood or serum. Their classification is as follows:

EXTERNAL CEPHALHEMATOMA, .	1. Subaponeurotic, spurious cephalhematoma, or caput succedaneum.
	2. Subperiosteal, the true cephalhematoma.
INTERNAL CEPHALHEMATOMA, . .	3. Subcranial.
MENINGEAL HEMORRHAGE, . . .	4. Subarachnoid.

It would seem to the authors, however, not only from their own experience, but also from a review of the literature of the subject, that true cephalhematoma can only be described as that form of blood tumor beneath the periosteum and external to the cranial bone—the form usually described as periosteal. Other forms of hemorrhage within the cranium belong more properly under the classification of “intracranial hemorrhage.”

Macroscopically, sections of cephalhematoma show that an extravasation of blood has taken place between the periosteum and the bone, the surface of the latter being roughened.

Some thickening, the result of inflammatory irritation, occurs around the margin of the tumor where the pericranium is attached, and it is at this point that the shell-like deposit of bone cells occurs.

Kirk, in his "Text-book of Physiology," describes the formation of these tumors as follows :

The principal bones forming the cranial vault are developed in membrane or fibrous tissue. This membrane later consists of two layers, an external fibrous and an internal cellular—osteogenetic or the true bone-forming layer. If a thick metal plate be inserted beneath the periosteum during its formation, it will soon be covered by an osseous deposit ; but if placed between the fibrous and the osteogenetic layer, the plate will not be covered with bone cells, thus showing that the osteogenetic layer is only capable of developing bone from its lower surface. When extravasation of blood takes place, as in the true form of cephalhematoma, the osteogenetic layer is pushed away from the bone, but continues its power to develop bone cells, and this deposit is increased around the area of limitation of the tumor,—that is, the point at which the periosteum covering the tumor joins that which covers the remainder of the cranium,—thus forming the hard bony shell which surrounds the tumor.

Diagnosis.—Cephalhematoma may be differentiated from caput succedaneum, hernia of the brain, craniotabes, and cranial angioma. From caput succedaneum it can be distinguished by the fact that cephalhematoma bears no relation to the difficulty of the labor ; on the contrary, it frequently does not appear until some days after birth. In cephalhematoma we find a fluctuating center to the tumor, but it lacks the boggy feel of caput succedaneum. There is no discoloration of the scalp in the former, as would be found in the latter. Cephalhematoma also never crosses a suture and is surrounded by the ring of bone before mentioned.

From hernia cerebri it can be distinguished by the absence of fluctuation in protrusions of the brain. In the latter case there will be pulsations which are synchronous with the child's heart beat.

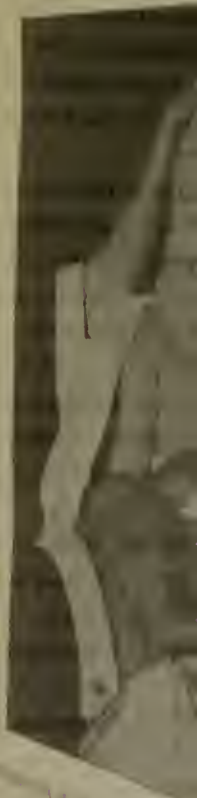
Hernia also enlarges when the child cries, and always shows itself between two bones or in the region of a fontanel.

Craniotabes can be diagnosticated by the softened patches which occur in the skulls of children affected with rickets ; these lack the swelling and clearness of outline of a cephalhematoma and no fluctuation is present.

In *vascular tumors* of the scalp there is discoloration of the parts and absence of fluctuation in the center ; there is no bony growth

Prognosis.—If the tumor is small and the child is otherwise healthy, the prognosis is favorable. If the tumor is large and the child is otherwise unhealthy, the prognosis is unfavorable.

Treatment.—If the tumor is small and the child is otherwise healthy, the treatment is conservative. If the tumor is large and the child is otherwise unhealthy, the treatment is operative.



HEMATOMA OF THE SKULL
The tumor is shown between the skull bones, and is surrounded by a ring of bone.

around the tumor, and the swelling bears no relation to suture or fontanel.

Prognosis.—Unless some systemic weakness is present, the prognosis is good.

Treatment.—In the largest number of cases cephalhematoma will disappear without any treatment whatsoever. In some instances where the tumor is not large shaving the hair and painting the growth with collodion or some evaporating lotion is recommended. In regard to aspirating or opening the tumor, the opinions of authors differ; the former treatment may be followed by sepsis, and the danger of severe hemorrhage may present itself after incision of the tumor where the growth connects with an extravasation of blood inside the cranium.



FIG. 13.—HEMATOMA OF THE STERNOCLEIDOMASTOID.—(From a patient in the Philadelphia Polyclinic.)

HEMATOMA OF THE STERNOCLEIDOMASTOID.

The most common cause of this tumor is injury to the neck of the infant following an attempt at forcible extraction of the head in a breech presentation.

The danger of the injury is increased where the infant is partially asphyxiated, in which case the muscles lose their tone, the vessels weaken, and on this account the escape of blood is more apt to occur. The direct cause of such a blood tumor is the laceration of a vessel and consequent hemorrhage into the sheath of the sternocleidomastoid muscle of one side.

Microscopic examination will show effusions of blood with rupture, more or less extensive, of the muscular fibers.

Jacobi considers prolonged extraction with forceps a frequent cause of this abnormality.

Symptoms.—The swelling may appear on the neck in from a few days to a week after birth, and on examination a tumor varying in size from a walnut to that of a hen's egg is found in the upper part of one sternocleidomastoid muscle, the right side being the most frequent site of the hemorrhage. The outline of the mass is somewhat irregular, and if existing for some time the growth may be cartilaginous. The duration of the tumor is from one to two months, after which time it slowly disappears.

In some cases chronic torticollis may result from such injuries. Paralysis of the arm on the injured side is occasionally seen. No especial treatment is needed.

UMBILICAL HEMORRHAGE.

Causes.—Hemorrhage from the umbilicus may result from slipping of a ligature attached to the stump of the cord by the latter cutting through the umbilical arteries or veins, from such excess of Wharton's jelly that the vessels are not properly compressed, or from the stump being cut too small for the ligature to hold. Bleeding from the navel is also a symptom found frequently in children suffering from asphyxia or atelectasis, from hemophilia, acute fatty degeneration, acute hemoglobinuria, or from syphilis. Pyogenic infection of the umbilical stump is also a frequent cause of hemorrhage.

Treatment.—The prophylaxis consists of the careful tying of the cord with an aseptic ligature after it has been washed with some suitable antiseptic solution. The treatment of the stump consists of inclosing it in a mass of gauze or absorbent cotton, dusted over with one part of salicylic acid, boric acid, or acetanilid to three or four parts of starch powder.

The stump should be placed on its upper side, with its dressing held in place by a moderately firm abdominal band. Where umbilical hemorrhage results from pathologic causes, such as have been previously mentioned, attempts should be made to tie the bleeding vessels by means of a silk ligature or two sterilized surgical pins, the latter being passed through the stump at right angles to each other and a ligature wrapped around the pins in the form of a figure eight. Various styptic applications may be indicated, and pressure by a cotton pad and tight binder should be made.

The **prognosis** of umbilical hemorrhage resulting from any form of constitutional disease is usually far from good.

GASTRO-INTESTINAL HEMORRHAGE.

Causes.—Hemorrhage from the stomach or intestines may arise from the passage of blood through the intestines, blood having been swallowed in nursing from a fissured nipple. Such blood is either vomited or passed through the bowels as black or brownish-black masses.

Hemorrhage into the bowel, the result of long-continued pressure during birth, may cause evacuation of similar masses in the stools.

Perforation of a blood-vessel in the duodenum through an intestinal ulcer is a somewhat rare cause of this form of hemorrhage.

Hemophilia may also be a cause of gastro-intestinal hemorrhage, and when originating from this source the bleeding appears in the first day or two of life. Purpura and syphilis have also been given as causes.

Occasionally a slight bleeding from the intestine may arise without any apparent cause. Possibly this hemorrhage may be produced by a congested condition of the abdominal organs due to the change in the circulation at birth.

The **symptoms** are those of internal hemorrhage at any time of life. The child becomes restless, pale, the extremities are cold and the fontanel sunken. The child will vomit, and with the vomited matter blood will be found. This blood is usually brownish.

Characteristic brownish or brownish-black masses will be found in the discharge from the bowels. The abdomen becomes dull and tumid on percussion.

Pathology.—In many cases a postmortem examination will reveal

nothing but a simple congestion of the gastro-intestinal mucous membranes. In other instances ulceration of the stomach or intestines will be found.

Treatment.—The treatment should be directed toward checking the hemorrhage, where this is possible. For this purpose ergot or ergotin, the latter in doses of from $\frac{1}{4}$ to $\frac{1}{2}$ of a grain, may control the bleeding. The drug may be given mixed with simple syrup or mucilage. Tannin or gallic acid in small doses, in syrup of rhatany, are advised by some.

Occasionally good results follow gentle irrigation of the bowels with hot water, temperature of 110° F. (43.3° C.) the injection being given from a fountain syringe and containing a two per cent. mixture of creolin.

OBSTETRIC PARALYSIS.

Definition.—A form of paralysis of the central or peripheral nerves occurring in the new-born and usually following prolonged efforts at forceps or manual extraction, or from other injuries to the head or extremities during birth.

Causes.—The most frequent cause is attempts at using the forceps as a means of compression or forcible rotation to the fetal head instead of using the instrument as a tractor only. Occasionally, after delivery of the shoulder in a presentation by the breech or vertex, prolonged traction made by hooking the fingers in the axillæ will result in injury to the brachial plexus. One or more nerve-trunks may suffer traumatism, and from this will arise a form of paralysis of the arm known as Duchenne's paralysis. A very common form of peripheral paralysis is that known as "Erb's paralysis," or "the upper arm type of paralysis." This arises from injury to the fifth and sixth cervical nerves. The muscles affected are the trapezius, and, to a greater extent, the deltoid, biceps, brachialis anticus, supinator longus, or the supra- or infraspinatus. Any or all of these muscles may be involved.

In a number of cases the violent separation of the head from the shoulders, and the consequent stretching of the plexus at the junction of the fifth and sixth roots of the brachial plexus, may be a cause, as has been pointed out by Walton, Carter, and others. The first-named author gives as his opinion that in most of these cases the plexus is,

during labor, already brought against the clavicle, rotation of the head away from the affected side takes place, and at the same time the suprascapular nerve is put on the stretch between the point of its emergence and the bony edge around which it passes to reach the infraspinous fossa. As the head separates from the shoulders after rotation has occurred, the shoulder being firmly held at the brim of the pelvis, its suprascapular nerve is stretched still further and the plexus bruised against the clavicle. As additional evidence in favor of his view, the author calls attention to the fact that the right arm is generally affected in left occipito-anterior and right occipito-posterior positions and presentations, while paralysis of the left arm is most generally seen in those cases where the position and presentation has been a right occipito-anterior.

When facial paralysis occurs, it is usually due to pressure by the forceps upon the seventh nerve at its point of exit from the stylomastoid foramen. This form of paralysis, although occasionally permanent, usually disappears in from a few days to a week or two after birth. A much graver and more lasting form of paralysis is apt to occur from injury to the brachial plexus in the manner before described. The pressure upon the cords of this plexus may either occur in the axillæ, or, as Ross has demonstrated, the fifth cranial nerve may be easily injured by a grip of the blade upon the upper arm and clavicle at a point where the nerve descends over the transverse processes of the fifth and sixth cervical vertebræ. Lane has also reported a case of injury to the brachial plexus by forceps—the face and arm were paralyzed. On postmortem examination a clot of blood was found at the stylomastoid foramen and around the cords of the brachial plexus.

Paralysis of central origin following labor may arise from pressure by blood-clot; thus, Lihotzky has reported cases in which pressure arose from this cause, probably induced by fracture of the orbital ridge by forceps. Hirst has reported a case of laceration of one of the sinuses of the dura mater caused by the overlapping of the parietal bones during labor. Precipitate labor, following which the child has fallen to the ground, has been given as a cause of paralysis in the new-born. Instances of cerebral atrophy with hemiplegia, either alone or associated with sensory and mental debility, and accompanied by frequent epileptiform convulsions, due in many cases to birth lesions, are reported by Allen Starr and others; and other instances of the

late effects of forceps compression have been reported by Osler, who, in the records of the Philadelphia Infirmary for Nervous Diseases, found nine cases following instrumental delivery. Six of these had histories of direct injury by forceps, and some of them had marks on the head existing since birth. In all of these cases the paralysis appeared gradually a short time after birth.

Symptoms.—Where paralysis of the arm or leg is present, there will be deficiency or absence of motion in the parts affected, and in a short time the muscles will appear soft and flabby, unless for a time masked by the abundant superficial fat. More or less complete anesthesia will be noticed. If the paralysis is of a mild type, recovery generally sets in early and may be complete. If severe, and the case remains in about the same condition for a long time, the chances for recovery are less favorable. As the peripheral nerves are not developed until several weeks after birth, any injury to them prevents their ever attaining functional competence. The response to electric tests varies with the degree and nature of the lesion; if it can not be excited or if the reaction shows the anodal closure contraction to be greater than the cathodal contraction, then there is little hope. While the paralysis is usually confined to one nerve or one limb, it may be bilateral where the injury extends to both sides. If the face is involved, the first symptom generally noted is a lack of movement of the facial muscles of one side; in some cases one eye may be injured, and drooping of the eyelid, contraction of the pupil, or retraction of the eyeball will be present; lack of expression on the injured side of the face and irregularity of the mouth will complete the picture.

Diagnosis.—Although paralysis due to causes incident to birth is generally easily diagnosticated, yet occasionally, from a medicolegal aspect, as well as that of the possible outcome of the case, it becomes necessary to consider certain points of differentiation. In cases of severe injury following the use of forceps, especially where compression has been used, a depressed spoon- or funnel-shaped mark will commonly be found on the areas of the fetal skull which have been within the grasp of the forceps. Occasionally these will be bounded by a well-defined ridge. The most common sites for these marks are the orbital and parietal regions and at the parieto-occipital junction. As a point of differentiation from the above, Fritsch has described the characteristic injury of the head received in falling after precipitate

birth as follows: "The fracture begins in a suture and extends outward to the middle of the bone. Usually there is but one fissure, which ends where the bone is thickest. The parietal bone is the one most often injured, and the fissure usually ends in the parietal eminence." Where the brachial plexus is injured, the paralysis affects but one arm, and will generally appear very soon after birth; usually while washing the child the nurse will observe that it moves but one arm, while the other hangs uselessly by its side. On examination, no evidences of a fracture of the bone will be found, and passive movement of the arm causes little or no pain. The paralysis is not generally followed by contraction. Electricity will frequently be found to be of use in determining the injury; thus, Angear has pointed out that where the nerve is but slightly injured there will be more or less response to the faradic current, but if the injury be great, there will be little or no response.

Prognosis.—The prognosis of facial palsy of simple form, and not the result of intracranial hemorrhage or fracture, is good. The muscles usually assume their activity at the end of a few weeks. Where traumatism has occurred to the large nerve-trunks, where laceration has resulted, or where the nerves have been injured to a large extent, the paralysis will be slow in disappearing and permanent injury may result.

Treatment.—The treatment of injuries of the nerves of the newborn may be divided into prophylactic and curative.

The prophylaxis requires the careful study of every case of delivery. By the accurate use of abdominal palpation and auscultation the position of the child in utero must be made out and the relative size of the fetus to the birth canal through which it must pass should be determined.

While the judicious use of the forceps to aid the expulsive forces of the uterus is fully justifiable, yet long-continued traction or the high application of the forceps without axis traction can not be too strongly condemned. It is utterly useless and very dangerous to both mother and child to attempt to drag a fetus through a birth canal which is too small for it, and efforts to do this would be followed by nothing but disaster.

When, after a carefully made diagnosis, including the measurement of at least the conjugate of the pelvic inlet, it is found that the child

is too large to pass, or, inversely, that the mother's parts are too small, operative procedures must be resorted to—either the Cesarean operation or symphysiotomy, and for the choice of these the student is referred to the text-books on obstetrics.

In cases where an infant is born with symptoms of cerebral compression following forceps delivery, the treatment by surgical means may be considered and the depressed bone elevated.

Where injury to the brachial plexus has occurred, the treatment should consist of rest for the injured arm and, later, passive exercise. Where the arm itself is injured, it should be wrapped in cotton batting and fixed to the side, care being taken that in bathing or dressing the child the arm is not allowed to hang down, as by so doing the injuries to the nerves may be increased. Tight bandages must be avoided. At the end of four or five weeks the muscles may be treated by massage, shampooing, and galvanism.

As the progress of these cases is at best very slow, treatment must not be discontinued so long as any improvement, no matter how slight, continues. Massage and electricity do much good in these cases.

UMBILICAL POLYPI.

Polypoid granulations around the umbilicus occasionally appear and cause an oozing of blood. The treatment should consist of cleanliness and the application of some antiseptic, such as peroxid of hydrogen in a spray and solutions of silver nitrate.

The **prognosis** is generally favorable.

UMBILICAL HERNIA.

Hernia through the umbilical ring arises from imperfect closure of the parts. The congenital form may be the result of the non-closure of the ventral lamina or it may be due to the continuance of the fetal condition in which a coil of intestines remains outside the abdominal cavity, the result of imperfect closure of the anterior walls of the latter. In other words, there is an arrest of development of the abdominal walls, while one or more coils of intestines, which, during embryonic

life are developed outside the abdominal cavity, fail, by the deficient development of the latter, to be inclosed in the usual way. Climate seems to have some effect as a cause of umbilical hernia; thus, according to Wert, Spain and Portugal have the highest percentage of cases of rupture in proportion to the population and South America the lowest. In the United States, Minnesota has the highest average and West Virginia the lowest. Umbilical hernia may be congenital or acquired. In the congenital form the most frequent cause is the arrest of development of the abdominal walls, as before described. Another cause of this variety of hernia is probably the failure of the normal process of atrophy of the umbilical vesicle. The acquired form is much more generally seen in badly-nourished, poorly-developed children, or in those who have been weakened or debilitated by disease. It is not infrequently seen in children with chronic diarrhea or in the same class of children who, from any reason, have violent attacks of vomiting or coughing. An elongated uvula may act, by producing violent efforts at vomiting or coughing, as a secondary cause of hernia. Rectal polypus and chronic diarrhea have also been given as causes. No matter from what source the hernia arises, it will appear as a soft tumor in the center of the umbilical ring. This tumor will be increased by the act of coughing or efforts of bearing down. The site of the protrusion, while usually occurring in the position named, occasionally appears above the ring between the recti muscles. In this latter instance it is more properly called ventral hernia.

Treatment.—In early life a complete cure can often be effected by drawing the two sides of the ring together after replacing the hernia, and passing bands of rubber adhesive plaster about the abdomen so as to keep the ring closed. The strips should be about $\frac{1}{2}$ of an inch wide. This dressing must be repeated from time to time until the intestine ceases to protrude. Care must be taken, however, that the delicate skin is not chafed by the adhesive plaster. To prevent this the skin may be dusted before dressing with some mild aseptic powder.

The ordinary treatment consists of covering a convex button with cotton or buckskin and making pressure against the ring with the convex side of the button, the latter being held in place by a bandage around the abdomen.

Operative treatment is sometimes useful, as in the case described by

Runge, where the hernia was cured by radical surgical means sixteen hours after birth. Where the umbilical ring remains open and surgical means can not be tried, the hernia must be replaced and the opening closed by a suitable truss. This truss usually consists of a convex rubber button, held in place by a spring or a rubber bandage.

DISEASES CHARACTERIZED BY JAUNDICE.

ICTERUS IN THE NEW-BORN.

Synonyms.—YELLOW GROOM; INFANTILE JAUNDICE; GELBSUCHT; ICTÈRE.

Usually about the third to the fifth day of life, a certain amount of yellowish discoloration of the skin appears. This first manifests itself in the face, and quickly spreads to other parts of the body. It continues for five or six days and gradually disappears. The urine during this time assumes a saffron color, and examination will reveal an excess of bile-pigments. This condition is known as physiologic jaundice. It occurs in from sixty to eighty per cent. of infants, and is rather more common in children born in hospitals than in those seen in private practice.

Causes.—The following theories have been ascribed as causes of jaundice in the new-born infant:

Following birth, a rapid destruction of blood-corpuscles takes place, this producing an excess of bile-pigment. The jaundice then is said to be of hematogenous origin (Virchow). It is also supposed that a certain amount of blood from the portal vein, owing to a patulous condition of the ductus venosus, passes into the general circulation without being acted on by the liver. The swelling of Glisson's capsule is also given as a cause; this swelling commences at the umbilical vein and prevents the discharge of bile through the hepatic vessels. Other causes, such as alteration of the blood pressure at birth and congested condition of the skin, have been given.

Symptoms of the Simple Form.—A slight yellowish discoloration of the face appears about the third or fourth day, and in the course of a few hours the entire body assumes a yellowish tint.

As a rule, there is but a slight yellowish tinge in the conjunctiva or

sclerotic, or if, as sometimes happens, this does appear, it is late in the condition. No especial treatment is required other than some mild laxative, such as a half teaspoonful of olive or castor oil or the following formula :

R. Calomel, gr. $\frac{1}{10}$
 Pulv. ipecac, gr. $\frac{1}{8}$
 Sodii bicarb., grs. ij.

Sig.—To be given every two or three hours.

MALIGNANT JAUNDICE IN THE NEW-BORN.

Under the title of morbid or malignant jaundice in the new-born infant may be described the discoloration of the skin and co-existing symptoms resulting from retention in the blood of various bile products, due to stricture, congenital or acquired, to catarrh of the gall-duets or gall-bladder, duodenal catarrh, defective hepatic circulation, asphyxia, melena, Winckel's disease, long-continued birth pressure, syphilis, or a continued exposure to damp, cold, or impure atmosphere. Septic infection of the new-born is also ascribed as a cause.

Symptoms.—In conjunction with the symptoms of any of the diseases given as causes, we find the ordinary jaundice in the new-born continuing beyond its usual period of duration. These symptoms are accompanied by increasing drowsiness, subnormal temperature, and failure to nurse. The stools are black and tar-like. Unless amelioration of the symptoms occurs, death follows on about the tenth day.

Diagnosis.—This is easily made from the color of the skin, conjunctivæ, character of the stools, and, in the malignant form, the general symptoms. Of great importance is the differentiation of the disease causing it. When the jaundice arises from acute fatty degeneration or from hemoglobinuria (Winckel's disease), the blood changes (see description of these diseases), purpuric patches in the skin, hemorrhages, or cyanosis will aid in the diagnosis.

Where obstruction to the duct of the gall-bladder (hepatogenous jaundice) produces the disorder the discoloration is intense and no bile can be found in the stools.

Treatment.—The treatment must be directed to the cause. Action of the ducts and intestine should be stimulated by small doses

of calomel combined with phosphate of soda, chalk, or lime. Attention must be paid to the skin, to increase as far as possible its activity.

The infant should be kept in a warm, pure atmosphere and should be fed as much as possible on breast milk or the best artificial substitute that can be obtained.

The action of the kidneys must be increased as much as possible by small quantities of hot boiled water given regularly.

WINCKEL'S DISEASE.

Synonym.—ACUTE HEMOGLOBINURIA OF THE NEW-BORN.

The disease was first described by Winckel, who reported the results of an epidemic in which twenty three cases were affected by the disease in the Foundling Hospital in Dresden, in 1879.

Pathology and Symptoms.—The disease is characterized by a swelling of Peyer's patches and the mesenteric glands. In the cases reported by Winckel, the pyramids of the kidneys were colored a blackish-red with stripes of hemoglobin coloring. The liver and other viscera were affected by fatty degeneration. "Hematogenic icterus is present, the hemoglobin being extensively changed into bilirubin; the urine is reddish-brown in color and contains epithelial casts, hemoglobin, and micrococci." The first symptoms noticed are a bluish tint of the face, body, and limbs. A little later there usually appears some yellowish discoloration of the skin of the entire body. These symptoms begin about the fourth day and progress rapidly. Diarrhea and vomiting soon make their appearance, and in a short time the child refuses to nurse. The duration of the disease is usually about two days, the child dying in convulsions or collapse. The mortality in Winckel's cases was nineteen out of twenty-three.

ACUTE FATTY DEGENERATION IN THE NEW-BORN.

Synonym.—BUIH'S DISEASE.

The **cause** is obscure, although in some instances the origin has been ascribed to a condition of lowered vitality in the mother during pregnancy. Apparently the disease begins in the latter portion

of gestation. Asphyxia has been given by some as a probable cause and by others as a result of the disease.

Pathology.—The pathologic changes seem to consist of a general parenchymatous inflammation of all the organs. Small hemorrhagic patches are found in the various viscera, and some of these organs are found infiltrated with blood and bile. Microscopic examination of the tissues of the various internal organs, and particularly of the liver, kidneys, and heart, will show a state of acute fatty degeneration.

Symptoms.—The disease usually appears in from the first to the sixth day of life, the child becoming jaundiced or pale; hemorrhages occur from the intestines or umbilicus. Petechial patches will be found under the skin and mucous membranes, particularly that of the mouth. Actual hemorrhages may also take place from the various mucous surfaces. There is more or less cyanosis, and actual asphyxia may be produced by fat emboli being washed into the pulmonary circulation. Dropsy, general or local, will be seen in many cases.

The **treatment** consists of stimulating the patient as much as possible and checking the hemorrhage; for the latter purpose, ergot or tannic acid in suitable doses are to be given. In the majority of cases the child dies, notwithstanding all our efforts in its behalf.

DISEASES PRODUCED BY SEPTIC INFECTION.

GENERAL SEPTIC INFECTION OF THE NEW-BORN.

Septic infection in the new-born may arise either from ante- or postpartum causes. The most frequent causative factor is the entrance of infective micro-organisms through the granulating surface left by the stump of the umbilical cord after the latter has fallen off. From this origin an inflammation of the arteries and veins results, and subsequently thrombi and infiltration of the surrounding tissues follow. The infection usually travels along the course of the umbilical arteries within the abdomen, and later frequently involves the bladder and tissues immediately surrounding it. During the progress of the infection within the body the umbilical scar may remain open, or, as is not uncommonly found, may close and heal, there being nothing

left but a small ring of inflammation surrounding it. Weber and Runge have pointed out that in those cases in which infection has occurred through the umbilicus, the tissue around the artery is first involved after the infection has traveled within the abdomen. The iliac vessels and retroperitoneal connective tissue are usually not attacked.

As a result of general septic infection, peritonitis and metastatic abscesses may appear in the abdominal viscera, or the joints may become involved and arthritis follow. In two-fifths of the reported cases Runge observed pneumonia or pleurisy followed by small metastatic abscesses.

Where the case has a fatal termination, death usually results from pneumonia or pleurisy, although pericarditis is not an uncommon cause.

Symptoms.—In antepartum sepsis, in those cases in which the child is born alive, death usually occurs in a few days from interstitial pneumonia or fatty degeneration. Where the child dies before birth, the skin will be found macerated and effusions of bloody serum occur in various cavities of the body. Patches of ecchymosis will be seen in the peritoneum, pericardium, and pleura.

The symptoms of postpartum infection usually begin with a ring of inflammation around the umbilicus; this is often followed by ulceration (omphalitis). In quite a number of cases this inflammation may subside and the umbilical scar will appear to be partially or completely healed. The infant will, however, have a fever ranging from 101° F. to 103° F. Anorexia appears and the child refuses to nurse. The usual jaundice following birth, instead of disappearing on the third or fourth day, will continue to increase, the stools remaining dark and tar-like. Some distention of the abdomen, with general symptoms of peritonitis, soon manifest themselves, the child holding its legs and thighs constantly flexed. The breathing is thoracic in character and is rapid. In some cases ulceration of the mouth, pharynx, intestines, bones, or joints may be observed. Emaciation is rapid and progressive; vomiting and diarrhea sometimes appear. The inflammation of the larynx may result occasionally in actual croup (septic croup).

Where death occurs, the immediate cause is usually convulsions or exhaustion, pleurisy or pneumonia.

The **prognosis** in septic infection of the new-born is distinctly bad.

Treatment.—The best preventive treatment of septic infection in the new-born lies in the careful attention to the umbilicus from the moment of section of the umbilical cord until the time that it has fallen off and the wound is completely healed. It should be remembered that the site of the umbilical cord is always an absorbing surface through which septic micro-organisms may gain entrance to the child's body, and therefore as much care should be directed to the antiseptic dressing of the cord stump as would be exercised in dressing any other wound. During the process of mummification of the cord stump it should be kept covered with some drying antiseptic powder. It is of great importance that the cord stump should be kept dry. When a drop or two of pus appears in the umbilicus after separation of the cord stump, the folds of the umbilical scar should be carefully mopped out with a saturated solution of boric acid applied by means of cotton or, what is better, a few drops of hydrogen peroxid dropped in from a medicine dropper.

The great superiority of the latter antiseptic lies in the readiness with which it passes between all the folds and crevices of the umbilicus and removes all foci of infection.

Intra-uterine infection should be guarded against as far as possible by careful attention to the mother's health during gestation. Various constitutional diseases, such as syphilis or gonorrhea, should be suitably treated, and all sources of infection from irritating vaginal discharges should be removed by the use of antiseptic douches and cleansing the external genitals during the last week of pregnancy. The constitutional treatment of an infant suffering from septic fever is the same as the treatment of sepsis in the adult, remembering, of course, the age of the patient. The high temperature should be reduced by cool sponging and possibly some alcohol, the latter in doses suitable for the age and condition of the child. Minute doses of strychnin and quinin are also of use.

OMPHALITIS.

Definition.—An inflammation of the navel itself or of the surrounding parts.

Cause.—In the majority of cases omphalitis is of septic origin,

although occasionally its cause may be doubtful. According to Fryde, the disease is frequently caused by syphilis. It may confine itself to the umbilicus and immediately surrounding tissues, or may spread and involve nearly the whole of the abdominal wall, either superficially or throughout its entire thickness. The disease begins in the second or third week after birth and may continue for some time. Unless the inflammation extends to the peritoneum, the prognosis is fairly good. In some perfectly normal infants separation of the cord is followed by a slight irritation: this is particularly the case where undue friction or any form of local irritant has been applied. This condition is known as *excoriation* of the navel.

Occasionally after detachment of the cord a serous discharge is noticed; this may exist for some time and is known as *blennorrhagia*. The site of the umbilicus may also be affected by a *croupous* or *diphtheric* exudate.

The **treatment** of all these forms of inflammation of the umbilicus consists of absolute cleanliness and attention to the rules for prevention before mentioned. Where abscesses form, they should be opened and treated antiseptically.

TETANUS IN THE NEW-BORN.

Cause.—Tetanus in early life, like the disease in adults, is produced by infection with the tetanus bacillus. The usual site of entrance is the umbilicus before the scar is completely healed. Soiled dressings or general uncleanness are the means of transmission. The disease usually appears about the ninth day of life; hence the name "nine-day fits" has occasionally been applied to the disease. It may not, however, appear until the fifteenth day, which has been described by West as the limit at which we usually see the disease. Cases have been reported as early as the third day.

Tetanus in infancy may occur in any part of the world, the largest number of cases being found in warm climates. It may arise sporadically or in epidemics; thus, we have reports of the serious epidemics occurring in the Island of St. Kilda, reported by Dr. G. A. Turner,* and of that occurring in the Island of Heimacy, off the coast of Ice-

* "Glasgow Med. Jour.," 1895, No. 3, p. 161.

land, which took place early in the present century, reported by J. Snowman.* It seems probable that, as the knowledge of the use of antiseptics, especially as applied to the dressing of the cord stump in new-born infants, is understood and practised throughout the world, these epidemics of tetanus neonatorum will decrease or almost disappear. The value of the antiseptic dressing of the umbilicus was clearly demonstrated in the epidemic occurring on the Island of St. Kilda, where the mortality of cases occurring previous to the introduction of asepsis was 100 per cent. ; the number of cases affected decreased after its introduction to *nil*.

Symptoms.—The first phenomenon noticed is inability to nurse because of spasms of the muscles of the jaw and face generally ; this is known as *trismus*. The facial spasm is soon followed by a similar condition arising all over the body, the attacks increasing rapidly in severity and length of continuance. The face has the peculiar expression described under the name of “risus sardonicus.” There is also frequently associated with the disease a peculiar whining cry. The climax of the malady is generally reached in twelve hours, and when the child dies it is in spasms or coma. The convulsions, like those of tetanus in the adult, are increased by cold or by noises. The entire course of the disease is usually about two days.

The prophylactic treatment consists of observing the rules before mentioned in dressing the cord. For the treatment of the convulsions hydrate of chloral, chloroform, and alcoholic stimulants give the best results. Opium, cannabis indica, belladonna, and bromid of potassium have been recommended. Warm baths and ice applied to the spine have occasionally been of use. The prognosis is exceedingly grave.

INSPIRATION PNEUMONIA.

This disease is usually caused by inspiratory efforts on the part of the child due to pressure on the umbilical cord during a prolonged labor. It is most commonly found in those cases where the vaginal secretions of the mother have been rendered septic by a pre-existing gonorrhea or endometritis.

The type of pneumonia is usually lobular, and is very dangerous to

*“ Brit. Med. Jour.,” 1895, vol. II, p. 132.

life. The treatment should be prophylactic, care being taken that the vaginal secretion in the mother is rendered aseptic by douches. It must be remembered in the treatment of this disease that the condition is of septic origin, and therefore the principal indications are to sustain the patient by the use of tonics, alcohol, etc. Locally, the lung conditions should be treated as any other form of pneumonia.

SCLEREMA.

Definition.—By the term sclerema we understand a hardening of the skin and subcutaneous cellular tissue. The condition is accompanied by a lowering of bodily temperature.

Causes.—Sclerema may be congenital or acquired; in the latter case it is most frequent in children prematurely born and in those affected by progressive atrophy. The disease is most commonly found in hospitals and foundling asylums, particularly where many children are crowded together. It is generally supposed that the subnormal temperature is the primary consequence of improper hygienic surroundings, and that the changes in the skin and subcutaneous tissue are secondary conditions.

Symptoms.—The infant at birth may appear healthy, but within a few days it begins to lose flesh rapidly and progressively; the temperature at this time falls to about 92° to 96° F. (33.3° to 38.6° C.) in the rectum. The hardening of the skin usually begins in the lower extremities and spreads upward, affecting, in the order given, the trunk, the upper extremities, and the face. The skin changes to a dirty yellow color; it is hard, does not pit on pressure, and seems to be closely attached to the subcutaneous tissue. The surface of the body feels cold and stone-like.

Pathology.—The pathologic changes are in many cases obscure. In a case reported by J. W. Ballantyne there was found, on microscopic examination, to be an increase in the number and size of the connective-tissue bundles and an atrophy of the adipose tissue. Northrup reports a typical case in which no abnormal changes were found in the skin. Langer and others believe that solidification of the fatty tissues, in consequence of the very low temperature, is the cause of the stiffening of the skin. It has also been suggested that in some cases the causes are very much the same as those producing

myxedema. In many of these patients a postmortem examination will reveal an edema of the subcutaneous tissues, the secretion frequently being changed into jelly-like masses. Serous effusions into the pleura sometimes occur.

Prognosis.—The prognosis is bad in nearly every case, the disease generally ending fatally in from one to four days.

Treatment.—The treatment consists of improving, as much as possible, the hygienic surroundings of the child, giving massage and also alcoholic stimulants in moderate doses. Such drugs as camphor, musk, etc., have been recommended. Where possible, the infant should be fed by a wet-nurse, or if it can not suck, the milk must be given by the rectum, or the child may be fed by a medicine dropper inserted far back in the mouth.

MELENA IN THE NEW-BORN.

Definition.—A malignant form of hemorrhage from the stomach or intestines, occurring in the new-born.

Causes.—The hemorrhage may be due to a gastric or enteric ulcer; to thrombosis resulting from embolism in the vessels of these organs. Congenital weakness of the vessels of the stomach or duodenum, or persistence of the ductus arteriosus have been ascribed as causes.

Symptoms.—The symptoms are vomiting of blood or its passage in the stools. This condition is accompanied by rapid loss of flesh, failure to nurse, and continued hemorrhage, until the child dies of collapse. The attack usually lasts from one day to a week. While the prognosis is grave, cases occasionally recover.

Treatment.—The treatment consists of the administration of warm antiseptic rectal irrigations, and the administration, by the mouth, of ergot or some astringent remedy.

CHAPTER III.

GENERAL HYGIENE OF INFANTS AND CHILDREN.

As soon as the child is born it should be laid on its side upon the bed far enough away from the mother to prevent her rolling upon it. The first attention after severance of the cord should be directed to the breathing, care being taken that inspiration and expiration are regular. Any accumulation of mucus in the mouth should be removed by a finger covered with soft muslin or lint soaked in a solution of boric acid. Should the respiration be weak, the child should be held head downward and a small stream of cold water poured on the chest. Slapping the buttocks or chest with a towel wrung out in cold water will often aid in the establishment of respiration. Where asphyxiation occurs it should be treated according to methods previously described. Care must be taken to see that no bleeding occurs from the umbilical stump, and that the ligature is fastened securely. The material used for the ligature must be sufficiently strong to hold without slipping and at the same time not be so thin as to cut through the jelly of Wharton or possibly the umbilical vessels. Frequently if slipping of a ligature does occur in from twelve to twenty-four hours after the birth, the vessels are sufficiently contracted to prevent hemorrhage; indeed, we have observed in at least two cases in which the ligature has slipped but a few hours after birth, the hemorrhage has proved very slight. The material used in tying the cord should be a double strand of linen thread or a single strand of "G" linen fishing-line. A stout ligature of twisted silk will do very well. The ligatures in all cases must be rendered aseptic before applying.

One of the most important objects for attention is the eyes of the new-born infant. As soon as respiration is established and the cord tied, the eyes should be carefully washed with a solution of boric acid; in many cases this is sufficient. However, it is generally recommended that a drop or two of a solution of five grains of nitrate

of silver to the ounce of distilled water be dropped in the eyes from a medicine dropper. This may again be advantageously followed by carefully mopping the eyes with sterilized water, after any excess of silver nitrate has been neutralized by instilling a few drops of a ten per cent. solution of sodium chlorid. Where the mother has had a purulent vaginal discharge, it is often necessary to instil into each eye a few drops of a 1:12,000 solution of bichlorid of mercury, followed by a similar application of distilled water. Before giving the infant its first bath it is necessary, on account of the sticky, cheese-like secretion which covers the skin (*vernix caseosa*), to smear the child's body with either olive oil or vaselin. Unless this is done the *vernix caseosa* is extremely difficult to remove. The first bath should be given in a room the temperature of which is from 65° to 70° F. (18.3° to 21.1° C.); the temperature of the water should not exceed 96° F. (35.6° C.), as the skin of the new-born is extremely sensitive, and a too hot bath may cause irritation thereof, which may amount to an actual dermatitis. Soap may be used in this bath, providing it is free from strong alkalies, the best soap being a superior grade of castile, or, as some recommend, Unna's "over-fatty" soap. After bathing, the skin should be mopped dry with a soft towel, after which it should be dusted with a powder consisting of two per cent. of salicylic acid and finely powdered starch, or boric acid or thymol, five per cent. in starch powder. Some prefer to use the oil alone, wiping this carefully off after applying, and to use no water for several days or weeks.

The infant should be dressed in a soft, unstarched material, made loose, so as to prevent pressure and allow perfect freedom of motion. It is well to avoid all excessive ornamentation with lace. The diapers should be made of soft absorbent material, and sufficient number provided to allow of change and washing after each evacuation of the bowels and bladder.

The cord stump should be dusted with any of the antiseptic powders before referred to, and may be laid so that the severed portion points upward, and covered with a little bag of gauze or a small pad of absorbent cotton, held in place by an abdominal binder of light flannel, care being taken that this bandage is loose enough not to interfere with respiration.

As soon as the child is washed and dressed, it should be laid in a

small crib by itself. It ought never to be allowed to sleep in the same bed with the mother, as there is danger of her rolling over on it during sleep and causing suffocation.

Shortly after the child is washed and dressed it should receive a teaspoonful or two of hot sterilized water; this acts on the kidneys, aiding in the establishment of urination and stimulating renal action generally. It is well to put the child to the breast from two to four hours after birth, or as soon as the mother is adequately rested.

The life of the new-born infant in health may be divided into two periods—namely, feeding and sleeping.

As the child advances in age the amount of sleep required becomes less, until at two years the number of hours of rest should amount to about thirteen out of the twenty-four, and at three years about eleven hours of sleep are sufficient. Starr recommends that the following rule be observed regarding the hours of feeding and rest:

From birth to the end of the sixth or eighth month the infant should sleep from 11 P.M. until 5 A.M., and as many hours during the day as nature demands and the times of feeding, washing, and dressing will permit. From the eighth month to the end of two and a half years the child should sleep from noon until 1.30 or 2 P.M., and at the time of taking this nap it is to be undressed and put to bed. At 7 P.M. it should be put to bed for the night. From two years and a half to four the morning nap may occasionally be omitted, according to indications, but in all cases he recommends that the time for the night's rest properly begin at 7.30 P.M., and should last until six or seven o'clock in the morning. After the fourth year the interval of repose in the daytime need not be insisted upon, but the child should be put to bed by 8 P.M., and sleep for at least ten hours. Where possible, the sleeping-room and the room occupied in the day ought not to be the same; or where this is not feasible, the child should be removed to some other room for an hour or two before retiring for the night, and the sleeping-room well aired. The temperature of the room should be from 64° to 68° F. (17.8° to 20° C.), and this temperature is to be maintained as uniformly as possible.

The Bath.—The child should be bathed at a regular time each day, one bath in the twenty-four hours being considered enough. This should be given during the morning, at a time about half-way between the first two feedings. The temperature of the room should then be

about 96° F. (35.6° C.), and kept free from drafts. The first step in bathing should be to thoroughly wet the child's head in order to prevent its taking cold. The duration of the bath should be from three to five minutes, after which the skin must be well dried and rubbed with a moderately coarse towel. After the bath the body should be covered with a blanket or flannel night-robe, and the infant put to sleep again for a short time. It is strongly recommended that occasionally in hot weather an additional sponge bath of water at a temperature of 90° F. (32.2° C.) be given, which will have a cooling effect upon the skin. In older children cool baths at a temperature of from 72° to 76° F. (22.2° to 24.4° C.) sometimes are more valuable than warm ones. Very cold baths, except in rare conditions, are not to be recommended for children. They are, however, occasionally useful as a tonic or stimulant, increasing the excretive powers of the skin and giving tone to the body. These baths must always be given in a warm room, the child standing in enough hot water to cover the feet. The cold water should be applied by means of a sponge, one sponging of the whole body being sufficient. The temperature of the water used ought not be below 64° F. (17.8° C.). In many cases the addition of an ounce or two of sea salt or ordinary rock salt will increase the good effects of the bath, which should be followed by a thorough rubbing with the hands and a coarse towel. Another method of giving a cold bath is to allow the child to stand in hot water while the body is enveloped in a sheet wrung out of water at a temperature of 60° F. (15.6° C.), and the entire surface of the body well rubbed through the sheet, after which the child is rubbed with a towel until the skin is thoroughly dry. This method is applicable to older children.

A bath at a temperature of 94° to 100° F. (34.4° to 37.8° C.) is frequently used to produce diaphoresis, to relieve nervous irritability, and to promote sleep. Where considerable stimulation is required, mustard may be added to the water in quantities from a teaspoonful to a tablespoonful. As a general thing five minutes is long enough for immersion in a hot bath.

Exercise.—Muscular exercise in some form is necessary to the maintenance of health. Nature provides this in young infants in the frequent motion of the whole body, so that all that is necessary is to undress a young baby and let it lie on its back and kick and move

at will. As the child begins to creep, and later to walk, the muscles of locomotion and of co-ordinated action are slowly developed.

A baby may be taken out of doors from three weeks to a month after birth, and from that time on it should be kept in the open air for a certain part every day, providing the weather permits. Moderately cold weather, if the air is dry, need not keep any but a very young infant indoors; the child, however, should be well wrapped up. In hot weather the head should be protected, and the child should, of course, be kept away from the direct rays of the sun. Exercise in older children is best managed in the moderate use of the ordinary games, especially those which take the child out of doors. Games not only help to develop the muscular system, but also give the child an object to obtain in mastering them; besides this, the obedience taught by the rules of games affords a certain discipline which acts for their good. In stormy weather children may be warmly clad and allowed to run about and play in a room with the windows up. As a rule, it is best not to allow a child out of doors at night.

Care of the Mouth.—The mouth of the newly-born infant should be gently cleansed every day with boiled water and a soft cloth. The hands of the mother or nurse should be clean before attempting to wash the mouth of the infant. Too frequent or anything but the most gentle methods of doing this are to be discouraged, as the epithelium of the mouth of the infant is very delicate and much harm may be done by injuring it. From the appearance of the first tooth, on through the cutting of both temporary and permanent sets, the teeth should be carefully and gently brushed once or twice a day. Neglect of this predisposes the teeth to become carious.

The Nursery.—The nursery must be a fairly large room, preferably facing the south, so that plenty of sunlight can enter it freely. If possible, it should not be on the ground floor or, on the other hand, it should not be at the top of so many flights of stairs as to be inconvenient. It should be heated by an open fire or, as Holt recommends, by a Franklin radiator. Steam-heat or gas should not be used. Ventilation is of the greatest importance, and at the same time direct drafts are to be avoided; this can be accomplished best by any of the usual forms of ventilators which are designed to be placed in the windows. The furniture should be simple in style, not too much in quantity, and of plain, solid surface, not basket woven, so that it can

A.



A Model Nursery (First View). Arranged under our direction by John Wanamaker.

THE UNIVERSITY OF CHICAGO PRESS



B.



A MODEL NURSERY (SECOND VIEW). Arranged under our direction by John Wanamaker.

Care of the Genital Organs

be easily cleaned. All heavy hangings are to be condemned. The floors should be covered with rugs, tightly fastened to prevent the child or nurse with the baby in her arms from tripping. The bed on which the child lies should be furnished with a hair mattress and a pillow of the same material; no hangings of any sort should be used about the bed. Cradles which rock are an abomination, and should be excluded. For lighting a nursery, oil or gas may be used; the former presents many points of usefulness, providing the lamps can be so placed that they can not be upset; on the whole, gas is to be preferred. At night a small wax night-light is all that is required. The temperature of the room should not be above 70° F. (21.1° C.) during the day and about 64° F. (7.8° C.) at night. The nursery should not be used as a place for drying diapers and clothes generally; nothing can be more unhealthy, not to say disgusting, than to see a line filled with diapers hanging in front of a nursery fire—a sight much too familiar to many physicians.

Care of the Genital Organs.—The genital organs of children should receive attention, particularly as to cleanliness. In the male child, if the foreskin is long and the preputial orifice of normal size, simply drawing back the former and carefully, but thoroughly, cleansing the glans with warm borax water or with castile soap and water is enough. Where the preputial orifice is somewhat contracted and adherent, the adhesions should be broken up by gently rotating the closed blades of a small pair of dressing-forceps about the glans, after which the prepuce should be stretched gradually from day to day until the foreskin can be drawn easily back over the glans. When the foreskin is very long circumcision should be done.

The genital organs of female children require little but simple cleanliness.

CHAPTER IV.

FEEDING AND FOOD OF INFANTS AND CHILDREN.

Probably the most important factor in the care of infants and young children is the selection and preparation of their food and the manner and regularity in which it is given. Nature has provided in the milk of the healthy human female a food perfectly adapted to the needs of the infant. Where the secretion of milk is plentiful and of good quality, the question of the nourishment of the child is a very simple one. It is only where various disturbing causes affect the mother's milk and artificial foods have to be resorted to that the regulation of the one and the selection of the other are matters which require much thought and considerable scientific knowledge. The infant may be fed in one of four ways: from the mother's breast, from the breast of a wet-nurse, by the milk of animals so modified as to resemble human milk, and by foods containing starch or dextrin. It is a mistake to suppose that in all cases the mother's milk is the best food for the child. It is only where it is of such quality and quantity as to be thoroughly adapted to the digestive organs of the infant that it fulfils all that is required of it. In order to supply a good quality of milk the mother should be strong and healthy, provided with proper food, and be maintained in good hygienic surroundings. She should have a reasonably even temperament and be desirous and willing to take upon herself the various responsibilities of her position and to make it her special mission to fit herself for the duties of nurse. During the period of lactation all other responsibilities must give way to those of the care and feeding of her child.

FEEDING FROM THE BREAST.

The Breast.—The breast is a compound racemose gland, whose glandular tissue is lined with a peculiar type of epithelium endowed with the power of extracting from the blood the peculiar properties

of fat, proteids, and sugar which, held in suspension in water and combined with salts, form that peculiar emulsion which we call milk. The secretion of milk, and, indeed, the formation of its various component parts, may be influenced by many causes. It has been many times proven that the various emotions, changes of atmosphere and food, overexertion, mental depression or shock, and many other causes will change the composition and qualities of milk so as to render it indigestible. Even variations in the regularity of the intervals between nursings may produce an effect upon the milk; thus, as Rotch has pointed out, a prolonged interval lessens the solid constituents in their proportion to the water, while a too short interval increases the amount of solids in proportion to the water in the milk. It is also possible that the appearance, and, to a greater extent, the continuance of menstruation influences the quality of milk, and pregnancy certainly does so to a very marked degree.

An infant should be put to the breast within two to four hours after birth, or as soon as the mother is thoroughly rested from her labor. At this time, except in rare instances, very little milk is secreted, and the infant will get practically nothing but colostrum, which has a slightly laxative effect. It will be often found that at first, and at several subsequent attempts at nursing, the infant fails to take hold of the nipple, and some method must be adopted to teach the child how to nurse. This can be best done by drawing the nipple out carefully and moistening it with a little sugar and water or barley water or, better, by squeezing gently a drop of milk from the nipple. This must be done before each nursing until the child learns how to take the nipple itself. It is of great importance that the child shall early be accustomed to regular hours of feeding during the first week of life or until the milk secretion is thoroughly established. The infant should be put to the breast every two hours during the day, and if asleep should be awakened and encouraged to nurse, rather than allowed to get into the habit of nursing at irregular intervals. This is of importance not only for the child but also for the proper maintenance of the quality of the mother's milk. At night, however, it is well both for the sake of the mother and child that the nursing should not be attempted at so frequent intervals as during the day. The digestive organs of the young infant need the night in which to rest, just as do those of the adult, and it is only fair that the mother should

also enjoy this time for rest and repose. However, as the interval from say 10 P.M., the time of the child's last nursing, until early in the morning is rather too long for a young infant to go without some nourishment, it is well that it should be put to the breast once during this time. The following table gives the number of feedings for the day and night and the intervals between each from birth to the end of the first year :

AGE.	INTERVALS.	NUMBER OF FEEDINGS IN TWENTY-FOUR HOURS.	NUMBER OF NIGHT FEEDINGS.
From birth to 4 weeks, . . .	2 hours.	10	1
From 4 to 6 weeks, . . .	2 " "	9	1
From 6 to 8 weeks, . . .	2 $\frac{1}{2}$ " "	8	1
From 2 to 4 months, . . .	2 $\frac{1}{2}$ " "	7	0
From 4 to 10 months, . . .	3 " "	6	0
From 10 to 12 months, . . .	3 " "	5	0

The length of time at each feeding during which the child should be allowed to nurse must vary a little according to the amount of milk secreted, its quality, and the general condition of the child. The fairly strong infant a week old will be able to retain in its stomach from one to three ounces of milk, and to get this will require that the child be kept at the breast, on an average, for about fifteen minutes. Quite frequently it may require persistent efforts on the part of the child to take the nipple at all, even when it has been moistened by the extraction of a little milk or by the other means before mentioned. A little patience on the part of the nurse will, however, usually conquer the difficulty. After the third day or the beginning of the fourth, the secretion of the milk is well established. The filling of the breasts is usually accompanied by certain symptoms consisting generally of a rise of temperature and some nervous disturbance. The breasts at this time become swollen, tense, and more or less painful. After the secretion of milk is thoroughly established, the regular intervals between the nursings must be kept up. It is of importance that the mother, especially if the child be her first, be taught how to nurse it, and also how to regulate her own life, diet, exercise, etc., so as to keep the nutritive properties of her milk in the best possible condition. This knowledge does not come by instinct in the majority of cases, as many seem to believe, but must frequently be taught by the physician.

While feeding from the breast, the infant should be held partly on the side, and may suck from the right or left breast, the better plan being to nurse it from each breast alternately. The mother should sit in a comfortable position, on a rather low chair, with the body bent slightly forward, and the nipple drawn out so that the child can easily take hold of it. One of the mother's hands may be used to regulate the flow of the milk by placing the first and second fingers above and below the nipple. It is of the greatest importance that when nursing the child the mother should not be overheated, or have recently suffered from any profound nervous disturbance. After the child has been satisfied, the nipple should be washed with a mild solution of boric acid, and in many instances it is well that the child's mouth should be treated in the same manner. In cases where fissures or erosions of the nipple occur and nursing is extremely painful, a nipple shield may be used. Of these, many styles are on the market; probably the best is made of a simple bell of glass to which is attached a rubber nipple. Care should be taken that these nipple shields be kept scrupulously clean, or they may cause infection of the breast. Although intervals of about three hours between each feeding may be well followed in the majority of cases, still no fixed rule can always be maintained, as all women do not secrete the same quantity and quality of milk, and one infant may not take the same amount in a given time as another; but it is of the utmost importance that whatever interval be first adopted, this shall be maintained, unless there is some exceedingly good reason for changing it. Where the secretion of milk is plentiful, the child should be kept on breast milk alone until about the eighth month, when a system of mixed feedings may be adopted. This should consist of substituting for one of the nursings a proprietary food or some of the modifications of cow's milk, or the careful introduction of some form of animal diet, and, later, foods containing starch.

One fundamental principle must be remembered in the early substitution of any food for mother's milk, and that is, as has been stated by Rotch and others, that the human infant is practically a carnivorous animal, and therefore needs some form of animal food. The digestive apparatus up to the fourth or fifth month has practically no power to digest starchy foods, and therefore these must be excluded.

Contraindications to Breast Feeding.—Women who are

affected with acute fevers, syphilis, tuberculosis, or any form of wasting disease, should not, as a rule, nurse their children. Women who have uncontrollable attacks of temper or who are subject to violent emotions do not, as a rule, make good nursing mothers. Unwillingness to nurse the infant, irregularities in rest and exercise, continued indiscretions in diet, are all classed as contraindications to nursing.

Diet and Hygiene of Lactation.—It is of the greatest importance that the nursing mother be given a diet of good wholesome food containing all the elements necessary to keep her general health in the best possible condition. Food undoubtedly exercises a potent influence over the formation of milk. During the lying-in period, the diet should be light and at the same time of sufficient quantity. It should consist of milk, soup, vegetables, bread and butter, and gruels. After the first week, meat in moderate quantities should be given. Weak tea and coffee may be allowed in small quantities and cocoa and chocolate are both nutritious and pleasant. The malt liquors have been used for the purpose of stimulating the secretion of the milk, but it is questionable whether they have very much value for this purpose. Fish may be used sparingly, since in some instances it possibly may have a certain deleterious effect upon the milk. Exercise in the open air is of great importance in maintaining the equilibrium of milk secretion; the amount, however, must be arranged to suit the strength of the individual and should be regularly practised.

Deficiency in the Secretion of Milk.—Where the secretion of milk is poor, we should first attempt to stimulate it before taking the child from the breast and depending for its nourishment upon the use of any of the much inferior modifications of cow's milk or the still worse artificial foods. This can be done, first, by increasing the amount of milk-producing foods which the mother should take. The best of these, probably, is the extract of meats in the form of broths or soups. It has been many times proven that a diet largely of proteids will increase the quantity of all the elements in the milk. Rotch has also pointed out that a diet consisting largely of fats will not increase that element, but rather decrease it in milk. Next in efficiency are milk, cocoa, or chocolate taken at meals once or twice a day. As has been before stated, some of the malt liquors, particularly beer and porter, are sometimes used to stimulate the secretion of milk, but the prejudice against them and the danger of forming the alcohol habit

should make us extremely careful as to whom we recommend their use. Certain drugs, also, are of service for this purpose; foremost among these we have castor oil, given in small doses, say ten to fifteen drops in a soft capsule and repeated four or five times a day. Pilocarpin, given in the ordinary medicinal doses, may be of some value in increasing the quantity of milk. Massage of the breasts applied once or twice a day is a useful adjunct for this purpose.

Regulation of diet, exercise, and general mode of life do much to improve the quantity and quality of milk in a woman whose secretion is deficient. Where the watery elements are deficient in quantity these can be often corrected by allowing the woman to drink a larger amount of liquids. Too large a proportion of *water* can be reduced by decreasing the amount of fluids taken or by the administration of saline cathartics.

Where the *total quantity* of milk is too great, the amount of liquids and the diet should be decreased. Where the total amount of *solids* is too small, the nursing intervals should be shortened, the amount of liquids decreased, and less exercise should be recommended. Where the *total amount of solids* is too large, the nursing interval should be prolonged, the amount of exercise should be increased, as should also the proportion of liquids in the mother's diet. Where the *fat* is deficient in quantity, the proportion of meat in the diet should be increased. The reverse of this is indicated where the amount of fat is too great. Where the percentage of *proteids* is too low, the exercise should be decreased, the amount of proteid diet increased, and where, as is very rarely the case, the amount of *proteids* is too high, the amount of exercise should be increased up to the limits of fatigue, and the proteids in the diet decreased in quantity.

In cases where there is an oversecretion of milk and the breasts become pendulous, it is of great use to support them by means of a firm binder made of one or two thicknesses of muslin passed around them and pinned from below upward. This binder should be removed at the time of nursing.

Disturbances of Lactation.—The chief causes of the various disturbances of lactation are menstruation and pregnancy; the former may or may not produce change of sufficient consequence to warrant the weaning of the child. Not infrequently, by pumping the breasts during the time of the menstrual epoch, it is possible to tide both

mother and child over these periods, and nursing may be continued afterward. As a rule, however, the continuance of menstruation affects the composition of the milk to quite a marked degree. Pregnancy, as a rule, creates a much greater disturbance in the equilibrium of milk secretion than does menstruation, so much so that as a general rule it is probably best to wean the child as soon as it is known that the mother is pregnant. The following table by Rotch will show the variations in milk due to menstruation, pregnancy, and marked abnormalities in nutrition.

TABLES SHOWING TYPICAL ANALYSES OF A NORMAL, A POOR, AN OVER-RICH, AND A BAD HUMAN BREAST MILK (*Rotch*).

	NORMAL MILK. Healthy life as to exercise and food.	POOR MILK. Starvation.	OVER-RICH MILK. Rich feeding; lack of exercise.	BAD MILK. Pregnancy, disease, etc.
Fat,	4.00	1.10	5.10	0.80
Sugar,	7.00	4.00	7.50	5.00
Proteids,	1.50	2.50	3.50	4.50
Ash,	0.15	0.09	0.20	0.09
Total solids, . .	12.65	7.69	16.30	10.39
Water,	87.35	92.31	83.70	89.61
Total,	100.00	100.00	100.00	100.00

SHOWING THE EFFECTS OF THE CATAMENIA ON HUMAN MILK.

	NORMAL.	CATAMENIA, SECOND DAY.	SEVEN DAYS AFTER CATAMENIA.	FORTY DAYS AFTER CATAMENIA.
Fat,	4.00	1.37	2.02	2.74
Sugar,	7.00	6.10	6.55	6.35
Proteids,	1.50	2.78	2.12	0.98
Ash,	0.15	0.15	0.15	0.14
Total solids, . .	12.65	10.40	10.84	10.21
Water,	87.35	89.60	89.16	89.79
Total,	100.00	100.00	100.00	100.00

WEANING.

The age at which the child should be weaned can not be definitely fixed, as it varies somewhat with the amount and richness of the milk secreted by the mother and the general condition of the child. In the majority of cases it is not considered desirable to continue breast feeding beyond the eleventh or twelfth month. If it is at all possible, a child should not be weaned before the starch-digesting (amylolytic) function of the digestive apparatus is well developed. This does not occur before the sixth or eighth month, or, in other words, about the time the first four incisor teeth are cut. Let us say, then, that a child may be weaned between the sixth and twelfth months, but it is better that it should occur nearer the latter date than the former. After the twelfth month the child needs a stronger food than the mother's milk affords, and continued lactation, heretofore a purely physiologic function, begins to cause a considerable drain on the vitality of the mother. Many authorities believe, and indeed, in a number of cases facts seem to prove, that from this time the milk slowly becomes poorer in quality, and this is particularly apt to be the case if menstruation or pregnancy appear and continue. It is best that a child should not be weaned during the intense heat of midsummer, because of the danger of gastro-intestinal infection from cow's milk or other methods of artificial feeding. If possible, it is preferable to wean an infant during one of the interdental periods and in the cooler months of the year. The infant may be weaned either suddenly or by the gradual substitution of artificial diet. The former method is only indicated where there is a continued and persistent refusal on the part of the child to take the breast, or where the milk becomes changed from any cause, so as to have a bad effect upon the infant's health. Should the mother become affected with any disease, such as erysipelas, cancer, tuberculosis, or the acute fevers, we must regard this as an indication for the sudden withdrawal of breast feeding. In the gradual substitution of other methods of feeding Starr recommends the following rule: If the child be put to the breast every three hours from 5 A. M. to 11 P. M., or seven times a day, there should, during the first week, be one artificial feeding introduced daily. During the second week he recommends that two artificial feedings and five breast feedings be given, and in this manner increasing the number of artificial

feedings by one and reducing the number of nursings in the same proportion until the child is fed entirely on an artificial diet. This rule will be found an excellent one both in hospital and private work. It is of importance to know, and it sometimes requires no little study and care to find out, what food we shall use for the replacing of the breast milk in these cases. It frequently transpires that the various so-called mechanical foods, such as Mellin's food, Nestle's food, etc., will be found unsatisfactory in many of these cases, and probably better results will be obtained by feeding the child on some modification of cow's milk. A very good formula to begin with is the following :

Cream,	1 oz.
Milk,	2 ozs.
Sugar of milk or cane-sugar,	1 teaspoonful
Barley water,	3 ozs.
Salt, a pinch.	

The quantity may be increased to from two to six ounces if the digestive capacity of the child seems to warrant it. In regard to the method of gradual weaning, Cautley recommends the following :

METHOD OF GRADUAL WEANING.

	FIRST WEEK.	SECOND WEEK.	THIRD WEEK.	FOURTH WEEK.	FIFTH WEEK.
5 A. M.,	Breast.	Breast.	Breast.	Breast.	Breast.
8 A. M.,	Mixture.	Mixture.	Mixture.	Mixture.	Mixture.
11 A. M.,	Breast.	Breast.	Breast.	Mixture.	Mixture.
2 P. M.,	Breast.	Breast.	Mixture.	Mixture.	Mixture.
5 P. M.,	Breast.	Breast.	Breast.	Breast.	Mixture.
8 P. M.,	Breast.	Mixture.	Mixture.	Mixture.	Mixture.
11 P. M.,	Breast.	Breast.	Breast.	Mixture.	Mixture.

It has been our experience with young infants of weak digestion that, in place of one or more nursings during a period of gradual weaning, good results are accomplished by giving the child small quantities of weak animal broths. These should be carefully strained and administered in quantities of from one-half to one ounce. For this purpose beef juice, veal, chicken, or lamb broth, or the preparation known as Panopeptone, manufactured by Fairchild Bros. & Foster, has given good results. No infant can, however, stand this diet for

a long time, and it should only be used until a modification of milk can be found which will suit the child's digestion for continued use. Where a sudden attack of indigestion appears during the course of weaning, the number of artificial feedings should be decreased and the number of breast feedings increased.

FEEDING BY A WET-NURSE.

The advantages of this method of feeding are that the infant gets the benefit of being nourished with human milk with all its peculiar and valuable properties. The disadvantages are that wet-nurses are somewhat hard to get, and when procured there is some danger of the child's becoming infected with such diseases as syphilis, rickets, and tuberculosis. In selecting a wet-nurse certain facts must be borne in mind. In the first place, she should be subjected to a rigid examination, and demonstrated free from all taint of the diseases before mentioned or others. She should not be less than twenty-one years of age and not more than thirty-five. A very young wet-nurse is apt to be objectionable, partly from her methods and habits of life, partly from the fact that the milk is frequently of poor quality, and besides, as a rule, she has but little knowledge of the care of children. It is of importance that her own child should be about the same age as the child she intends to nurse, although some authorities consider it well that the nurse's child should be five or six months older than the one she is to care for. She should be in good health, not too fat, and of a placid disposition. Her breasts should be of good shape, well developed, and with good-sized, well-formed nipples. Before engaging a wet-nurse it is of great importance that a careful analysis of her milk should be made, and that the latter should be of a quality equal to the average standard of good human milk.

FEEDING BY THE USE OF MODIFIED MILK OF ANIMALS.

In the largest proportion of cases where the mother can not nurse her child from the breast, we must find a substitute in the milk of the cow or some other animal, either used in its original condition or modified in some form so as to better adapt it to the needs of

the infantile digestive apparatus, or else use some proprietary food containing principally starch or dextrin. For the purpose of feeding the human infant, cow's milk has the greatest degree of practical utility, from the ease with which it can be obtained and modified and on account of its mechanical composition.

The milk of the ass and of the goat are considerably used by the natives of the countries in which these animals are largely raised, and are of undoubted use. For nutritive properties and readiness of assimilation ass's milk stands quite high, but the difficulty of obtaining it makes it of little use in this country. An analysis of its constituents gives the following result :

ASS'S MILK (*Peligot*).

	MILKING INTERVALS.		
	One and a half hours.	Six hours.	Twenty-four hours.
Butter,	1.55	1.40	1.23
Sugar,	6.55	6.40	6.33
Casein,	3.46	1.55	1.01

The milk of the goat can be quite easily obtained, and is useful in certain cases. An analysis of a specimen, made for the authors by Mr. William E. Robinson, Jr., at the City Laboratory of Philadelphia, gave the following results :

Fat,	5.85 per cent.
Albuminoids,	4.49 "
Milk-sugar,	5.11 "
Mineral matter,	0.88 "
Water,	83.67 "
	100.00

The composition of cow's milk differs considerably from that of the human female. In the milk of the cow the proportion of proteids is much greater than in human milk, while the amount of sugar (lactose) is considerably less. Fat is present in about the same quantity in both, but its proportion to other elements is lower in cow's milk than in human milk. The quantities of fat, sugar, and proteids found

in cow's milk vary greatly in different specimens examined. Starr gives the comparative proportions of both as follows :

SOUND DAIRY MILK.

Reaction,	Feebly acid
Specific gravity,	1.0297
Bacteria,	Always present
Fats,	3 to 6, average, 3.75
Lactose,	3.5 to 5.5, average, 4.42
Albuminoids,	3 to 6, average, 3.76
Ash,	0.6 to 0.9, average, 0.68.

WOMAN'S MILK.

Reaction,	Persistently alkaline
Specific gravity,	1.0313
Bacteria,	Seldom present
Fats,	2 to 7 average, 4.13
Lactose,	5.4 to 7.9, average, 7.0
Albuminoids,	0.85 to 4.86, average, 2.0
Ash,	0.13 to 0.37, average, 0.2

And Rotch, in an analysis of 24,000 specimens of cow's milk, found the following results :

COW'S MILK.

Reaction,	Slightly acid
Specific gravity,	1.032
Water,	86 to 87 per cent.
Total solids,	13 to 14 "
Fat,	4.00 "
Milk-sugar,	4.50 "

ANALYSIS OF COLOSTRUM.

Fat,	1.71
Milk-sugar,	4.90
Proteids,	1.72
Ash,	0.79
Total solids,	9.12
Water,	90.88
	<hr/> 100.00

Colostrum is a fluid which is secreted by the mammary gland before the true secretion of milk appears. This fluid is characterized by the presence of peculiar corpuscles known as colostrum corpuscles.

It will be seen by reference to the analysis that the percentage of fat and sugar is much lower than in true milk, while the percentage of proteids is slightly in excess. Colostrum is generally considered to have a laxative effect on the intestines of the new-born infant.

A glance at the foregoing tables will convince us that whenever the milk of the cow or other animal is used for infant feeding, considerable modification will be necessary before it approximates in its composition to human milk. If we turn to the list of artificial foods, we find that in all starch or dextrin is the predominating factor. Now, we know that the digestive apparatus of the young infant up to the sixth or eighth month either can not digest starch at all or can only do so by being forced; therefore these foods, as a rule, should be passed by. The human infant needs an animal diet rather than a starchy one, and knowing this, we are compelled to acknowledge that as yet the highest ideal of a food to replace mother's milk is to be found in the milk of one of the mammals. Looking over the analyses of the milk of those animals which are at all available, we find that the milk of the cow offers the most convenient source of supply, and while it may not, in the proportion of its elements, approximate quite as nearly to human milk as that of some other animal, yet it is easy to obtain and is susceptible in a high degree of satisfactory modification.

Milk as a food contains in a condensed form all the elements necessary for the sustenance of the young animal of any species. In it we have the carbohydrates, the element necessary for the production and maintenance of bodily heat; the proteids, which are needed to build up and repair tissue waste, and the fats, which also aid in the maintenance of the bodily heat and give rotundity to the form. Along with these we have an amount of earthy salts necessary to aid in cell formation, and particularly in the building up of the bony structures of the body. Before taking up the subject of the adaptation of cow's milk as a substitutive food for the infant, we must consider for a moment the composition of human milk. As the milk comes from the breast, and before it is contaminated by contact with the outer surface of the nipple or the child's mouth, it is an absolutely sterile fluid, and consists of what is practically a finely-divided emulsion of fat and proteids (milk-fat and casein) suspended in a weakly alkaline solution of salts and containing a definite proportion of sugar (lactose). This fluid is warmed to the temperature of the body, and

in the breast of a woman in good health is absolutely free from bacteria. The proportion of the various elements are subject to considerable change, according to the health and habits of the individual and the period of lactation. Some authorities claim that there is an increase in the casein or caseinogen until the second month, from which time it diminishes until the ninth month; this, however, is by no means a constant rule. It is possible that the quantity of lactose may increase from the second to the eighth month. The liquid portion of the milk is derived from the blood; the other properties, such as casein or caseinogen, fat and sugar, are the special products of the secretory cells of the mammary gland. The milk-fat, or butter, in the form of finely-divided globules, is held in suspension in the liquid part of the fluid.

The period of greatest activity in the secretion of milk is from ten months to a year following the birth of the child. In the largest proportion of cases the most abundant secretion is during the first six months of this time, and at the end of this period the quantity and quality of the milk are at their best. Should the child die, or for any reason be prevented from nursing, the secretion of milk rapidly diminishes and disappears.

Rotch has given the following tables showing the composition of a number of specimens of good breast milk from the third to the ninth month of lactation.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
Fat,	2.00	2.00	2.00	3.00	3.50	4.00	4.00	4.00	4.50
Milk sugar, .	6.00	6.00	7.00	6.00	6.50	6.00	6.00	7.00	7.00
Albuminoids,	1.00	1.50	1.50	1.00	1.50	1.00	2.00	2.00	2.50
Mineral matter,	.17	.25	.25	.17	.25	.17	.33	.33	.41
Total solids,	9.17	9.75	10.75	10.17	11.75	11.17	12.33	13.33	14.41
Water, .	90.83	90.25	89.25	89.83	88.25	88.83	87.67	86.67	85.59
Parts, . .	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Chemistry of Milk.—In order to better understand the reasons for the necessity of modification of cow's milk, we must consider briefly the various constituents of both cow's and human milk, remembering always that the elementary principles of both are subject to very great variations according to the period of lactation and the results obtained by diverse analyses.

Fat.—Cow's milk, as a rule, contains about the same amount of fat as human milk. The fat is a mixture of glycerids of the fatty acids, the palmitic, stearic, and oleic, and the glycerids of certain volatile acids, chiefly butyric and others, such as caproic and caprylic. Over forty per cent. of the fat consists of olein. Under the microscope the fat appears as minute, shining globules; these, in a fresh specimen, are uniformly spread over the field, not being collected in groups. The amount of fat in milk will vary much from time to time, more, indeed, than any other constituent of the fluid; as a rule, however, each cubic millimeter of cow's milk should contain from 2,000,000 to 3,000,000 fat-globules. High temperature will cause a partial separation of the fat, which will rise to the surface and form butter. The percentage of fat in average cow's milk will range between 3.5 and 4.0 per cent.

Sugar.—Sugar exists in milk in the form of lactose. According to Leeds, this element occupies a peculiar place in the carbohydrate group between cane-sugar and starch. Its principal function in the infant's body is to supply, by oxidation, the normal heat, which can not at this early age be kept up by locomotion and general muscular action. Under the influence of certain bacteria, principally the lactic acid bacillus, the lactose is partly decomposed in the stomach and forms lactic acid. A certain proportion passes unconverted through the stomach into the intestines, where, by the action of the secretions of the latter, it is changed into glucose, and thus enters the portal circulation. The proportion of sugar in cow's milk ranges from 4.0 to 4.5 per cent., whereas in human milk it averages from 6 to 7 per cent.

Proteids.—The nitrogenous portion of cow's milk shows many important differences from that of human milk. Both contain large quantities of lactalbumin and casein or caseinogen. The proportion of proteids is less in human milk than in cow's milk, the relation being about 1.5 per cent. in the former and 4 per cent. in the latter. These proteids represent the nutritive elements of milk. They are partially in solution and partially in suspension, as is seen by filtering milk through porcelain, when nearly all the caseinogen is left behind with the fat, while a small portion of the caseinogen and other products is easily recognized in the serum. The coagulable proteids in cow's milk exist in a comparatively larger amount than in

human milk, so that under the same conditions a larger curd will be found in the former than in the latter. The casein of cow's milk can be precipitated into the form of coagula by the addition of dilute acetic acid or by saturating with a solution of sulphate of magnesia. Precipitation of the casein can also be made by adding rennet to cow's milk, when this substance is thrown down in the form of soft, dense flakes. Human milk requires much more acetic acid to extract the casein than does cow's milk, and when the precipitation takes place the casein does not occur in lumps but is in a fine powder, which dissolves in an excess of acetic acid. The lactalbumin remains in a solution as whey after separation of the casein, and is rendered insoluble by boiling; it is said to closely resemble serum-albumin (Leeds).

Inorganic salts found in the ash of milk contain principally the salts of lime, potassium, and sodium, usually in combination with chlorin and phosphoric acid. The following table represents the relation existing between the inorganic salts in cow's milk and human milk:

	COW'S MILK.		WOMAN'S MILK.	
Potash,	24.5	0.18	33.78	0.07
Soda,	11.0	0.11	9.16	0.03
Lime,	22.5	0.16	16.64	0.03
Magnesia,	2.6	0.02	2.16	0.01
Oxid of iron,	0.3	0.0004	0.25	0.0006
Phosphoric acid,	26.0	0.2	22.74	0.05
Sulphuric acid,	1.0		1.89	
Chlorin,	15.6	0.17	18.38	0.04

Reaction.—Human milk as it comes from the breast is invariably slightly alkaline in reaction. Cow's milk, on the contrary, has a somewhat acid reaction, and Rotch states that this is the case whether the milk has been tested directly from the udder or whether it has stood for twenty-four hours. Milk also contains small quantities of urea and citric acid.

Bacteriology.—Except in cases of local disease, human milk is usually considered sterile and there is no doubt that so far as the milk within the mammary gland goes this is the case, as has been shown by the researches of Escherich, who examined the milk of twenty-five healthy women and found it absolutely without bacteria. Cohn and Neumann, on the other hand, found micro-organisms in the milk of

forty-three out of forty-eight healthy women. The varieties of bacteria most generally present were the *Staphylococci pyogenes albus* and *aureus* and the *Streptococcus pyogenes*. Ringel having examined the milk of twelve healthy and thirteen unhealthy nursing women, found it sterile in three. Hoenigman reports that in seventy-six examinations of the milk of sixty-four women recently confined, he only found it sterile in four cases. The above-named bacteria were the ones most generally present. The number of micro-organisms in human milk varies much as to whether the specimen is from the first milk drawn or from that contained within the gland, the quantity of bacteria being much greater in the milk which first comes from the nipple than that within the milk ducts. The milk last drawn from the breast is usually quite sterile. Cow's milk, when obtained directly from the udder of the healthy cow by means of a trocar and cannula, is usually very nearly or quite free from bacteria. In cases where the udder and teats of the cow and the hands of the dairyman have been thoroughly antiseptized, it will be found that the milk obtained during the second half of the milking is sterile, while that first removed contains various micro-organisms which, in all probability, have made their way into the ducts of the teats from the outside. Cautley, quoting from Sedgewick and Batchelder, gives the following figures to show the enormous number of bacteria present in ordinary cow's milk, such as is served to consumers.

1. There were 67,143 micro-organisms per cubic centimeter found in samples of milk from the tables of persons in the suburbs of Boston in an average of fifteen examinations.

2. Over 250,000 per cubic centimeter were found in milk taken directly from the milk carts in Boston in an average of fifty-seven examinations.

3. Over 4,500,000 per cubic centimeter were found in milk obtained from Boston groceries. He also states that in milk obtained from the milk houses in London in 1896, the number varied from 848,400 to 8,119,200 per cubic centimeter. Renk found from 6,000,000 to 30,000,000 per cubic centimeter in the milk supply of Halle.

Analysis of Milk.—An analysis of the mother's milk should be made in all cases in which an attack of indigestion appears in a breast-fed infant. It is often necessary to test cow's milk in order to make

sure that the specimen used in infant feeding is of standard quality. In making an examination of a sample of human milk it is of great importance to obtain the entire milk secreted at one nursing, or, where this is impossible, it is generally advised that a portion of middle milk should be taken. The quality of the milk both of the human female and of the cow will vary greatly during the emptying of the milk glands, and on this account an examination of any one portion will prove unsatisfactory. The milk which is first drawn from the nipple is usually known as "fore milk." This contains a much larger percentage of water and a lower percentage of fat than does the bulk of the milk which is in the milk glands. The last milk drawn is known as "strippings"; it contains less water and a higher percentage of solids and fats than does middle milk. The term "middle milk" is applied to the bulk of the milk which is in the mammary gland. The following tables will show the differences in composition of the three grades of milk :

THE PERCENTAGE COMPOSITION OF COW'S MILK AT DIFFERENT STAGES OF THE MILKING (*Harrington*).

	WATER.	SOLIDS.	FAT.	ASH.
Fore milk,	86.66	13.34	3.88	0.85
Middle milk,	84.60	15.40	6.74	0.81
Strippings,	82.87	17.13	8.12	0.82

THE DIFFERENCE BETWEEN FORE MILK AND STRIPPINGS (*Wynter Blyth*).

	DEVON COW.		GUERNSEY COW.	
	Fore Milk.	Strippings.	Fore Milk.	Strippings.
Water,	90.319	83.94	88.4	83.394
Solids,	9.681	16.06	11.6	16.604
Proteids,	4.598	5.824	5.426	4.451
Casein,	2.387	4.304	4.708	3.435
Albumin,	1.83	0.975	0.451	0.86
Peptones,	0.381	0.545	0.267	0.156
Fat,	1.166	5.81	0.357	5.946
Sugar,	3.12	3.531	4.943	5.28
Ash,	0.797	0.895	0.874	0.929
Specific gravity,	1.0288	1.0256	1.04	1.023

TOTAL SOLIDS PER CENT. IN HUMAN MILK (*Reiset*).

	BEFORE SUCKLING.	AFTER SUCKLING.
1,	10.58	12.93
2,	12.78	15.52
3,	13.46	14.57

In the study of analyses of milk made by standard authorities we can not help but be impressed by the fact that no two of them show the same proportion of its various elements. The relative amounts of the constituents of both human and cow's milk will vary greatly from many causes, such as food, exercise, period of lactation, and the general condition of the subject from which the specimen is obtained.

The majority of the tests for milk which will be used in this chapter have been taken from the work of Professor L. Emmett Holt.

A certain general idea in regard to the quantity and quality of the milk secreted may be had from the inspection of the breasts and from studying the manner in which the infant nurses. Where the time spent in nursing is long, say from thirty to fifty minutes, the probabilities are very strong that the quantity is too small. On the other hand, if the breasts are conic in shape, hard, and full, the supply is probably abundant. A soft, flabby breast indicates a deficient supply of milk, and when noticed in combination with a prolonged period of nursing, the quantity of milk is almost certainly scant. Another method of testing the quantity of milk is to weigh the infant before and after nursing. This method would require very accurate scales, and is not always satisfactory. The quantity can also be measured by pumping the breasts at regular intervals throughout a given time, and estimating from this the amount secreted in twenty-four hours. The specific gravity is usually taken by means of a small hydrometer, which should be graduated from 1010 to 1040.

An increase in the proportion of fat represented by the cream lowers the specific gravity of the whole milk. The specific gravity increases with the proportion of other solid matter. The *reaction of milk* can be tested with ordinary litmus paper.

Microscopic Examination.—By means of the microscope we can determine in milk the size and division of the fat-globules, the presence or absence of colostrum corpuscles, and the presence or absence of blood, pus, or epithelium. The colostrum corpuscles are not generally found in milk after the twelfth day.

The estimation of fat can be made as follows : The glass cylinder of the cream gage (see C, Fig. 14), which holds ten c.c., is filled to the zero-mark with freshly drawn milk. This should be allowed to stand at the temperature of the room—that is, from 66° to 72° F. (18.9° to 22.2° C.)—for twenty-four hours, at the end of which time the amount of cream is read off. The proportion of cream bears a relation to the proportion of fat contained in it as 5 is to 3. Thus,

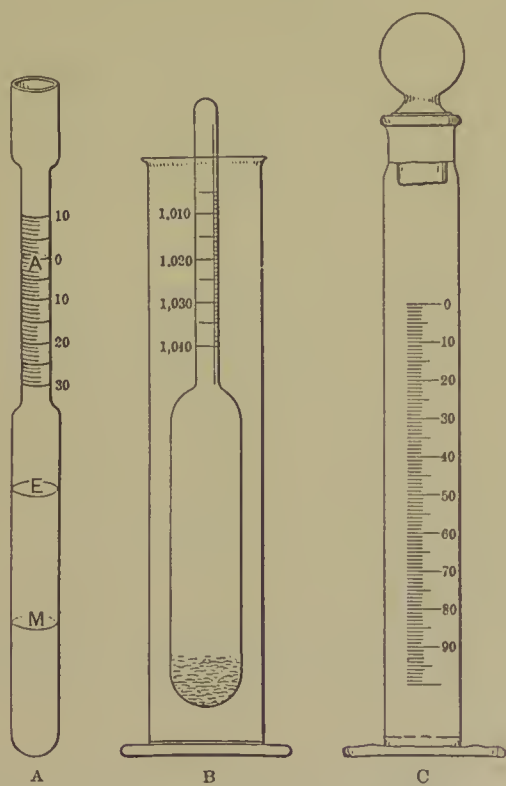


FIG. 14.—A. MARCHAND'S TUBE. B, C. HOLT'S LACTOMETER AND CREAM GAGE.

five per cent. of cream will indicate that the milk contains three per cent. of fat. A more accurate determination of the actual amount of fat can be obtained by the use of the Babcock centrifugal machine. By this method the fat is brought to the surface by centrifugal action ; previous to this the nitrogenous principles have been destroyed by sulphuric acid.

Another test is by the use of the Feser's lactoscope (see Fig. 15).

This test is made as follows: Four c.c. of milk are measured off in a pipet, put into a tube, and water slowly added, shaking from time to time until the black lines of the porcelain stem at A are clearly visible through the mixture of milk and water. The percentage of fat is then read off on the glass cylinder at the level of the water added; thus, if the water is to the mark 4, it indicates the presence of four per cent. of fat. This test is only applicable to cow's milk.

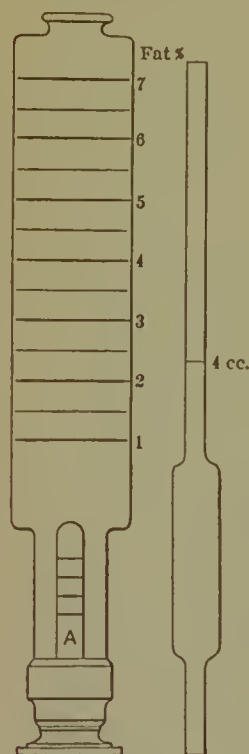


FIG. 15.—FESER'S LACTOSCOPE.

The test by the use of *Marchand's tube* (see A, Fig. 14) may also be used. This test can be made in the following manner: Five c.c. of milk are first poured into the tube so as to fill it to the line M, after which four or five drops of liquor sodæ are added, the mixture is well shaken, and five c.c. of ether are inserted so as to bring the mixture to the line E. The tube is now corked and shaken fifteen or twenty times, after which it is filled to the line A with ninety per cent. alcohol. The tube should now be tightly stoppered and shaken thoroughly, after which it is placed upright in a tall bottle containing water of a temperature of 120° to 150° F. (48.9° to 65.6° C.). The fat separates and forms a distinct layer at the top, and after half an hour the amount can be read off in degrees.

By reference to the following table the exact percentage of fat is shown:

DEGREES, MARCHAND.	PERCENTAGE OF FAT.	DEGREES, MARCHAND.	PERCENTAGE OF FAT.
1	1.49	13	4.29
3	1.96	15	4.75
5	2.42	17	5.22
7	2.89	19	5.68
9	3.36	21	6.14
11	3.82		

Each additional degree on the tube corresponds to 0.23 per cent. of fat.

Another test for the fats of milk may be made as follows: Five c.c. of milk are put in a stoppered tube graduated to fifty c.c. and shaken up with ten c.c. of strong hydrochloric acid. Next, place in a hot-water bath until the mixture turns dark brown in color, this change being due to the conversion of lactose into maltose; it will again become clear except for a small amount of floating coagulum of lactalbumin. It is then cooled under the tap, and when cold thirty-five c.c. of ether are added. The mixture is now well shaken up for a few minutes and allowed to stand. In fifteen minutes the fluid will be seen to consist of three layers—an upper clearer layer of ether containing fat; a lower clearer layer of acid albumin, water, etc.; and a narrow, intermediate flocculent white layer, about $\frac{1}{2}$ of an inch thick, of coagulated albumin. Read off the depth of the ether layer from the fifty c.c. mark to the middle of the layer of coagulated albumin. Then measure off rapidly two portions of ten c.c. each, taken from the ether layer, into platinum capsules which have previously been weighed. Place these in a hot incubator, and when the contents have been converted to dryness they should be weighed. Take the mean of the two estimations, and from that calculate the weight of fat in the lower ether layer; that is, of the five c.c. of milk under examination. Multiply by twenty to obtain the weight of the fat in 100 c.c. of milk (Schmidt's method).

Cream.—Cream must be regarded as milk which contains an excess of fat (Holt). Cream is obtained in one of three ways: by skimming, by the gravity process, and by the use of a centrifugal machine or separator. The following table will show the proportions of the various constituents of separator cream of different densities as compared with good cow's milk:

WHOLE MILK.		CREAM.			
		I.	II.	III.	IV.
Proteids,	4.00	3.90	3.80	3.60	3.20
Fat,	4.00	8.00	12.00	16.00	20.00
Sugar,	4.30	4.30	4.20	4.00	3.80
Salts,	0.70	0.70	0.64	0.60	0.55

Cream is known by the percentage of fat it contains; thus, in column I, the figure 8 represents an eight per cent. cream; in

column II a twelve per cent. cream, etc. The best centrifugal cream contains from twenty-five to forty per cent. of fat. According to Holt, the reduction of proteids in cream as compared with milk is but slight, being less than one per cent. Cream may be obtained by the gravity process as follows: Put one quart of average milk into a glass jar. This jar must be placed in iced water for four or five hours, at the end of which time it will be found that about ten ounces of cream can be taken from the top of the jar. Cream raised in this manner will contain, on an average, about eight per cent. of fat. If the jar is allowed to remain untouched for six hours, about six ounces of twelve per cent. cream can be taken off. The cream may be removed by skimming, or, what is more usually done, the milk at the bottom of the jar is siphoned off, leaving the cream still in the jar.

Another method of separating cream is by the use of the Cooley creamer. This consists of a wooden tank lined with metal, and of sufficient size to hold two or more cans of milk. The cans hold eighteen quarts and are so covered that they can be submerged. The bottom of each can is inclined, and at the lowest point of the incline is placed a faucet. A small piece of glass is inserted into the side of the can, so that the level attained by the cream can be seen. The cans are filled and placed in the tank of iced water. At the end of six or twelve hours the lower portion of the milk is drawn off and the upper layer, containing the cream, remains in the can. By this process any percentage of cream can be obtained.



FIG. 16.
TWELVE PER
CENT. CREAM.

The percentages most commonly used are eight, twelve, and sixteen.

*Estimation of Lactose (Cautley).—*Dilute ten c.c. of thoroughly mixed milk with fifty c.c. of distilled water and add dilute acetic acid. Filter off the precipitated caseinogen, mash up and wash the precipitate two or three times with water, and add the washings to the filtered precipitate. Raise this precipitate up to a known quantity, say 200 c.c. Place this in a buret, and estimate by means of a standard Fehling's solution.

Estimation of Salts of Milk.—To make this test take a platinum capsule containing the dried salts of milk, and heat it until all the contents are incinerated and only a white ash remains. Care should be taken not to heat the capsule to redness, otherwise small portions of the salts may be volatilized.

Estimation of Proteids.—The estimation of the proteids in milk can only be determined in a general way. The following rules will give some idea of the relative quantity present. If the quantities of sugar and salts are so nearly uniform as not to affect the specific gravity, an approximate estimation of the proteids may be made after having obtained the specific gravity and the percentage of fat. The specific gravity will vary directly with the proportion of proteids, and inversely with the proportion of fat, or, in other words, where the percentage of proteids is high the specific gravity will also be high. Where the proportion of fat is high the specific gravity will be low.

In endeavoring to estimate the proteids the specimen of milk used should be either from the whole quantity secreted in the breast during a given time or a specimen of middle milk.

Effect of Drugs on Mother's Milk.—While it has not been proven that all drugs are eliminated in part through the milk, yet a certain number, undoubtedly, are partially excreted in this manner. Their effect is usually more noticeable in poor than in milk of good quality. Among the drugs which particularly affect milk are the following :

Mercury: The effect of this substance upon the milk is very slight except after long administration, and even then it is very doubtful whether its action is sufficient to be of any importance.

Opium: It is possible that opium may be excreted in the milk in sufficient quantities to produce symptoms of poisoning in an infant. Its effects are more noticeable when the quality of the milk is poor. Holt states that a fatal case has been recorded.

Belladonna: It is possible for this drug to cause quite marked symptoms in the child when administered to the mother in full doses.

Potassium iodid: This drug may produce its effect upon the child through the mother.

Saline cathartics undoubtedly affect the child when administered to the mother.

Iodoform: When applied externally to the mother this drug may be found in the urine of the child in the form of iodine.

Arsenic and antimony have been found in the milk after their administration to the mother.

Morphin in medicinal doses is eliminated as apomorphin in the mother (Pinani). This, however, has been doubted by several observers.

CHAPTER V.
THE BREEDS OF COWS BEST ADAPTED FOR
INFANT FEEDING.

There does not seem to have been much opportunity, either here or in Europe, for scientific conclusions as to the distinct advantage to be gained by the use of any particular breed of cows for infant feeding; but clinically there appears to be well-established ideas to the effect that certain breeds of cows are better adapted than others for this purpose. Chemists have decided that the fats in the milk of the Channel Islands cows, and of one or two similar breeds found upon the continent of Europe, contain a smaller proportion of the fixed and insoluble glycerids of the fatty acids, and a larger proportion of the volatile and soluble glycerids than the milk of other breeds. As the volatile glycerids are more readily decomposed than the others, and are richer in those elements which are found in the fat of nuts, it may be that this is the explanation of the less digestibility of these milks, both for the calf and for the baby. It seems probable that the best cow to employ as a foster-mother for the infant should belong to a breed that invariably and successfully raises its own young. Of these, the Durhams, Devons, Ayrshires, Holsteins, and similar hardy breeds are favorably distinguished. Then, also, the vigor of constitution of the breeds of cattle and their ready and perfect acclimatization are also potent reasons why these hardy breeds should be preferred to the more delicate ones. The milk of cows possessing a fat in the most perfect emulsion and with the smallest fat-globules is more easily digested than the milk of such cows as the Jersey breeds, in which fat-globules are large and easily "creamed," or separated from the body of the milk-serum. Beside the peculiarities in the fats already referred to, there are other differences in the milks of various breeds of cows which may influence their value as a food for infants. For example, the proportion of fats to proteids is of importance, especially where home modification is principally employed.

Thus, the three per cent. proportion of fat of the milk of the Holstein (as compared with the four per cent. of fat of the better Durhams) when it appears in a milk containing over four per cent. of proteids makes the latter more difficult to modify than does the milk containing the larger amount and richer quality of fat—*i. e.*, the milk of the Durham. The character in the emulsion of the fat in the milk of various breeds of cows is an important matter. The milk of the Holstein holds its fine fat-globules in a very perfect emulsion, and separation by gravity, which is the manner most commonly used at home, is slow and less perfect. On the other hand, where milk is used in the nursery in an unmodified condition, it is always safer to use a milk that has a perfect emulsion of the fats, so that where it is set aside for the raising of cream by gravity the results are less varying and uncertain. The tendency to disease among the different breeds is slightly against the Jerseys and Guernseys, especially upon the Atlantic seaboard.

The Care of the Cow.—The cow whose milk is to be used for infant feeding should be cared for with this object only in view. Her stabling should be apart from other animals. Her food should be selected specially, and the water she drinks should be perfectly pure. She should be fed for the production of a digestible milk, and consequently the cow that makes the most butter from a given method of diet is not likely to be available for the feeding of a baby. A cow whose milk is intended for the use of infants should be groomed once or twice a day, protected from annoyances and frights, and generally treated as a member of the family. She needs sunlight, opportunity for open-air exercise, a fresh-air space of 1000 cubic feet, 80 square feet of floor space, and 12 square feet of window all to herself. Her bedding must be dry and clean—if possible, all dry mill-shavings or sawdust. She should be fed twice a day with good hay and grain,—such as wheat-bran, ground oats, cornmeal, etc., which have been ground or treated only by mechanical processes. She should never be fed with any of the by-products of the brewery or glucose factory. A certain amount of some succulent food should be given her every day. Thus, in the winter she should receive a measured quantity of sugar beets and carrots, and in summer an abundance of carefully-grown, absolutely freshly-cut green clover, alternating with green oats, green peas, green sweet corn, and the meadow grasses. She should never be

permitted to range the ordinary pastures of the farms in the second half of the summer, as many of the prevalent weeds then growing are distinctly injurious. From the third to the eighth or ninth year of her life is perhaps the best period for the production of milk upon which to feed an infant. It is probable that she should bear a calf once a year. It has not, however, been shown as yet that the prolonged lactation of a castrated cow is injurious to the milk intended for infant feeding. The milk should not be used until it is quite free from colostrum, nor should it be used in any advanced stage of gestation. It is probable that the catamenial period in a cow may render the milk for that day injurious to the infant, although in large herds it is probable that this occurrence may have no practical bearing on the use of the milk, but this word of caution is necessary if the infant is to be fed from the milk of a single cow. The milk from cows used for infant feeding should be weighed accurately both morning and night, and a difference of a single pound at milking is probably an evidence that the cow is out of sorts. This is one of the best guides for the inexperienced on this question. The cow for infant's use should have the constant supervision of a veterinarian, because perfect health in her is absolutely essential to the well-being of the infant.

The Care of the Milk.—The milker's hands, arms, and fingernails, before beginning work, should be well scrubbed with hot water and soap for five minutes and rinsed in running water. They should then be scrubbed in a solution of borax, glycerin, and water, or with a small quantity of alcohol. This should be done before each milking. The pail in which the milk is received should be absolutely clean and sterilized with boiling water or live steam. The milker should dress in a freshly-boiled and rough-dried suit of cotton cloth, or, as it is the custom with very careful dairymen, the milker's clothes should be sterilized in a closet in which circulates live steam and which is built expressly for the purpose. The milk as soon as drawn, and while still hot, should be filtered through sterile surgical cotton, then immediately cooled to a temperature below 50° F. (10° C.), after which it is put in sterilized glass jars, and kept in a clean, cold place until it is wanted for use. The milkers should be healthy men, living in healthy houses, and should be intelligent enough to understand the reasons and importance of perfect cleanliness. As precautionary measures are necessary against the well-known infectiousness of milk,

especially contamination from outside sources, the water in which vessels are washed and rinsed should be isolated from all possibility of infection and all vessels and tools used in the dairy should be sterilized with live steam after rinsing. All manipulation of the milk should be done in a place separated entirely from the barn and in which the atmosphere is kept free from dust and odors.

The Decomposition of Cow's Milk.—Milk in the udder of the cow is practically sterile, but as soon as it is drawn the germs of decomposition can be found in it, although the utmost care in all details has been employed. Some bacteria are present in newly-drawn milk. The barn, the cow, the milker, the hay on which the cow is fed, the bedding upon which she lies, the dust of the roads, from decaying vegetables, the common molds of cheese and bread, the ferment of butter-making even, to say nothing of the more extraordinary forms of bacteria, all have more or less effect in producing decomposition of milk. When milk is simply sour, it is because the common lactic acid bacteria have done their natural work upon the sugar. When milk is bitter, and the curd separates in cloudy masses, it is because the so-called "lab" ferments have acted upon the proteids. When milk is what is known as "blue" (though this must be carefully distinguished from blueness of common skim milk) it is because certain foreign bacteria have found their way into it. When milk is very red, from causes other than the presence of blood, there is reason to suspect a very dangerous form of contamination. Ropy or stringy milk is probably the vehicle for some of the pyogenic bacteria or their products. Some of these sources of decomposition are derived from the farm and dairy. Many are, however, supplied plentifully by any ordinary kitchen, refrigerator, the air of the nursery, and the unclean condition of vessels employed in the home. The only way to obtain a perfect milk is to produce it in a scientific way and to employ all aseptic and antiseptic precautions necessary for its protection against contamination. For this purpose cold and heat are the means which can most conveniently be used to keep a good milk as nearly perfect as is possible. A temperature below 40° F. (4.4° C.) prevents the growth of the few bacteria that the very best must contain. Heat will kill most bacteria and all the pathogenic milk forms commonly met with. It is probable that a temperature of 156° F. (68.9° C.) will render a milk safe for use, but it is seriously

doubted whether heat can render an impure milk nutritious. It is certain, however, that a perfect milk will remain so for an indefinite time at 35° F.; at this temperature also a pure and good milk will remain unchanged for a sufficient time for dietetic purposes.

SUPERVISION OF THE PRODUCTION OF MILK BY BOARDS OF HEALTH.

The majority of the States of this Union have, through their State boards of health, given much attention to improvement in the milk supply, and in a general way this authority is exercised in two principal directions; first, in the stamping out of certain infectious diseases prevalent among cows, and, secondly, in inducing the better management of barns and dairies. The rarer and more serious diseases of the bovine race have been thoroughly handled by most of the State boards, so that at present there is little danger from pleuropneumonia or from anthrax. A good deal of attention is now given by the State to tuberculosis in cattle, and, by the employment of tuberculin as a diagnostic agent in skilled hands, this disease may be so reduced that the danger of harm resulting from it is at a minimum. In cities of considerable size, a standard of milk quality, as to solid contents, is demanded of dairymen; from twelve to thirteen per cent. of solids being required to constitute a legal milk, while in some cities the percentage of fat is also defined, the requirements being not less than three per cent. Precise scientific public control of the milk products is as yet unknown and only the grosser forms of contamination and adulteration are at present regulated by law. It is left to the consumer to decide whether or not a milk is too old, too sour, or too dirty to be employed. The sources of contamination of milk are many and varied in number, and it may be said that a larger number of bacteria per cubic centimeter can be found in milk sold in the poor districts of many of our cities than can be found in the sewerage of the same city. A fresh milk often contains 20,000 bacteria to the cubic centimeter, and in an old specimen that has been exposed from 2,000,000 to 100,000,000 per cubic centimeter may be found. This contamination arises not only from bacteria, which may be considered natural to milk, and which may be comparatively harmless to adults, but also from bacteria which ought to be foreign to milk, but

are not. These more poisonous forms of micro-organisms are generally hurtful to both adults and children ; while it is safe to say that all bacteria in milk are harmful, if not indeed dangerous, to infants. Milk should be kept free from the fecal discharges of the cow, as it is always impossible to say what varieties of bacteria may be present at any given time in cow manure ; and it is certain that at times very dangerous species are passed by the animal. The pathogenic bacteria, those of such diseases as anthrax, pleuropneumonia, tuberculosis, sepsis of the udder, diphtheria, and other specific diseases of the cow, may be carried by milk to man ; and the bacteria of a number of the diseases peculiar to man, such as typhoid fever and cholera infantum, may through the carelessness of the milkers be carried from man to man by the vessels in which the milk is kept or by the milk itself.

Certified Milk.—A movement originating in a committee of the County Medical Society of Newark, New Jersey, under the chairmanship of Dr. Coit, of Newark, has resulted in the production of a very superior milk, known as certified milk. The dairies supplying the milk are subjected to a very strict supervision, and in the main very careful work has been done during the past four years. Every thirty days a committee of physicians visits these farms and certifies to the general condition of the dairies. Certificates from a veterinary surgeon in good standing, from one of the most eminent chemists, and from a well-known pathologist are obtained and distributed to all the physicians in the district. This milk has already found its way into over 500 families and the demand exceeds the supply. This would be the case in many other localities, if only the enterprise was understood and appreciated.

STERILIZATION AND PASTEURIZATION.

Various methods have been employed to maintain the nutritive properties of milk and at the same time destroy pathogenic bacteria. For this purpose heat has most generally been used ; either raising the temperature of the milk above the boiling-point, and maintaining it there for from twenty to thirty minutes, or of quickly raising it to near boiling for from eight to ten minutes. The former is known as sterilization of milk, and the latter as pasteurization.

Sterilization.—As the milk comes from the cow it is a sterile

fluid, but this condition of purity can only be maintained for a very short time, and for practical purposes the milk as delivered to our houses has passed through so many hands and has come in contact with so many vessels of at least doubtful cleanliness, that some method of reducing the number of bacteria to at least the minimum must be arrived at by artificial means. In order to attain this result, it was at one time the custom to raise the temperature of the milk by repeated heating to a point above the boiling-point of water. By this means all bacteria and their spores were destroyed, but the results obtained, as far as the nutrition of the child was concerned, were bad, largely by reason of the coagulation of the casein and the destruction of its nutritious principles. The fat globules also were made to separate from the emulsion and run together.

Sterilized milk had, in some cases, a beneficial effect in the prevention of gastro-intestinal disease, but the failure of its nutritive qualities, and its tendency to produce scurvy in young children, have caused us to seek some alternative which will destroy pathogenic bacteria and at the same time preserve the nutritive qualities of the milk.

Several implements have been devised for the sterilization of milk, probably one of the best having been invented by Dr. Louis Starr. This apparatus consists of an oblong tin case provided with a neatly-fitting cover, and having a movable false bottom, which is perforated and which stands a short distance above the fixed bottom. To the perforated false bottom is attached a frame-work capable of holding ten six-ounce nursing-bottles. On the outside of the case is a row of supports for holding the bottles while drying. A movable water bath is hung at the side, this being for the purpose of warming the food at the time of administration. It is intended that ten nursing-bottles should be used, so that the entire day's supply of milk can be prepared at once. Each bottle is provided with a perforated rubber cork, which is in turn closed by a well-fitting glass stopper.

The day's supply of milk should be sterilized in the morning immediately after it is served by the milkman. The directions for the process are as follows:

The bottles should first be washed with hot water, soap, and soda, and afterward rinsed in clean boiled water, and after being thoroughly dried they should be sterilized in the apparatus. Every bottle is to be filled with six fluid ounces of milk, after which the perforated

rubber corks should be inserted, but without the glass stopper. In place of both stopper and cork, a piece of absorbent cotton sufficient to close the mouth of the bottle may be used, as bacteria will not pass through this substance. The false bottom can now be removed and the filled bottles placed in the frame. The case should now be filled with water to the height of about two inches and the false bottom containing the bottles replaced. The lid may now be adjusted and the sterilizer placed on the kitchen range. Dr. Starr advises that a few minutes after the milk is thoroughly heated the glass stoppers be placed in the perforated corks. The water should be allowed to boil around the milk for twenty minutes, and at the end of this time the false bottom, with the bottles contained thereon, should be removed and the water poured off. The milk is now ready for use.

Other very efficient sterilizers are those devised by Arnold and Freeman. Milk prepared by the above process will remain free from bacteria for several days.

A very useful sterilizing apparatus is one devised by Dr. Roland G. Freeman, of New York. In the construction of this the inventor aims to do away with the differences in temperature that always occur between the milk at the bottom of the bottle and that at the top. The apparatus consists of two parts—a pail for the water and a receptacle for the bottles of milk. The pail is of tin and has a cover. A groove extends around the body of the pail to indicate the level to which it is to be filled with water, and there are supports inside for the receptacle which contains the bottles of milk to rest on. This receptacle is made of a series of zinc tubes fastened together, and this fits into the pail, so that the lower inch of the cylinders is immersed in water. In these cylinders the bottles of milk are placed. The receptacle has two sets of horizontal supports: the upper set, continuing around it, for use while the milk is being heated, and a lower set to be used for raising the milk while it is cooling. The tubes of the receptacle are long enough to each contain one bottle holding from six to eight ounces. When the receptacle is elevated so that only the lower portion is in contact with the hot water, the inventor claims that the temperature of the milk is equalized throughout the whole bottle.

Pasteurization.—By this process the milk is kept for a period of from ten to twenty minutes at a temperature of from 160° to 170°

F. (71.1° to 76.7° C.). While this process will not destroy all the bacteria present, yet such pathogenic organisms as the spores of tuberculosis, pneumonia, typhoid fever, etc., will be destroyed, and developed bacteria rendered inert.

Pasteurization may be accomplished by the use of any of the sterilizers before mentioned. As special appliances for this purpose are rather costly and somewhat complex, a much simpler one known as the Woodbury sterilizer has been devised. This consists of a light wire frame made somewhat in the shape of an old-fashioned dinner caster and containing six bottles. These bottles are graduated in ounces and have a screw top like a preserving jar. In the center of the screw top lid is a small opening covered by a cap, through which the steam escapes.

To use the apparatus, the bottle should be filled with milk, and after being placed in the wire frame, the whole apparatus is set in a vessel of boiling water, care being taken that the water in the vessel comes just about as high as the milk inside the jar. During the first part of the sterilization the small caps are left off, so as to allow the steam to escape.

The advantages of this apparatus are its cheapness and simplicity; the disadvantages lie in the fact that the child can not nurse directly from the bottles because they are not of the proper shape and size, but the milk has to be poured into a nursing-bottle, thereby exposing it to contamination by the air. Besides this, the screw thread which is cut in the glass for the top to fit over offers a favorable lurking-place for septic material.

A still more simple but rather less accurate method is as follows: Take the ordinary long, slender nursing-bottle, made of strong glass, and after pouring in the milk preparation and placing a small plug of absorbent cotton in the mouth of the bottle, stand the latter in a vessel containing boiling water for about ten minutes. The cotton will allow the escape of steam arising from the milk and at the same time will prevent bacteria from passing from the outer air into the milk. As a general rule, it is better that no more milk should be pasteurized than is sufficient for each nursing, and that the milk should be prepared in the same bottle from which it is intended to feed the child.

The shape and cleanliness of the nipple should receive careful atten-

tion. Probably the most satisfactory style is the one that has stood the test of years of use—namely, a nipple made of plain rubber and conic in shape. Another form has been devised with a small perforated protrusion jutting off from the narrow constricted portion, the object of this being to allow air to pass in, so as to prevent the nipple collapsing while the child is nursing. The nursing apparatus consisting of a perforated cork and rubber tube with nipple on the end of it should never be used, as it is impossible to keep clean no matter how carefully one may try. Such a nipple after a few days of use will be found swarming with bacteria along the entire inside of the apparatus.

After each nursing the nipple should be carefully scalded and washed in a strong solution of soda or borax, and kept soaking in a solution of boracic acid and water.

MODIFIED MILK.

In order to obtain the best effect from cow's milk as a substitute for human milk in feeding infants, a considerable degree of modification is necessary. During the earlier months of life a large majority of infants can not digest pure cow's milk, and attempts at using it as a continued article of diet generally result in failure. The results following its administration are apt to be loss of weight, constipation, vomiting, and colic. There are at present two principal methods of modifying cow's milk: it may be done in milk laboratories, or by the mother or nurse at home. For a large amount of the present knowledge on the subject of the scientific modification of milk the profession is indebted to the labors of Prof. T. M. Rotch, of Harvard University.

Milk Laboratories.—Of late years reliable milk laboratories have been established in several of the principal cities of the country. In 1891 Mr. G. E. Gordon established in Boston what was known as the Walker-Gordon Milk Laboratory. Since then branches of this house have been opened in New York, Philadelphia, Baltimore, Montreal, and Chicago. These laboratories furnish milk which is modified upon a physician's prescription, in exactly the same manner as an apothecary dispenses drugs. Briefly speaking, the principal points of superiority of this method are as follows: (1) The primal milk supply is under the supervision of the laboratories, and the cows are selected, cared for, and fed with but a single purpose in view—namely, the production

of a milk suitable for infant's use. (2) The freshness of the milk is not impaired by the process of preparation. (3) In these laboratories milk is modified exactly and scientifically. Every infant has its own milk freshly prepared, the formula being made to suit its particular digestion, the fats, sugars, and proteids being prescribed with this object in view. (4) The milk is modified and sold only upon a physician's prescription, so that over-anxious mothers and nurses can make no mistakes as to the quantity and quality of the milk preparation.

The greatest advantages in this method are the accuracy of the prepared food and its careful sterilization or pasteurization before its delivery. The principal disadvantages are that it is somewhat expensive, and at the present time such milk is hard to obtain within more than a hundred miles from any of our large cities.

In compounding modified milk the directors of the laboratories consider the milk only in the light of its component parts. In modifying milk the following articles are used: (1) Cream which contains sixteen per cent. of fat; (2) separated milk from which the fat has been removed by a centrifugal machine; (3) a standard solution of sugar of milk of a strength of twenty per cent. It is possible, by varying these elements in different proportions, to produce almost any degree of modification. In writing a prescription for a modified milk, the physician fills out a regular prescription form, furnished by the laboratory, using any percentages of fat, sugar, and proteids that may be desired, giving the quantity desired for each feeding and the number of feedings in the twenty-four hours. The laboratory furnishes a daily supply in the bottles from which the child is to be fed.

PREScription BLANK.—(*Rotch.*)

R.	Per cent.	
Fat,	4.00	Reaction, Slightly alkaline.
Milk-sugar,	7.00	Number of feedings, . . . 7.
Proteids,	1.50	Amount at each feeding, . 135 c.c. (4½ ozs.).
Mineral matter,		Heated for, 20 minutes.
Lime-water,		Heated at, 167° F. (75° C.).
Special directions.		Remarks.
For whom ordered.		Infant's age, 4 months.
		Infant's weight, 14 pounds.
Date,		Signature, M.D.

When it is necessary to wean the child or to partially substitute cow's milk in place of breast milk, an analysis of the latter should first be made. If the mother's milk agreed with the infant before it was weaned, a modified milk, the proportions of which are similar to the mother's milk, should be ordered by the physician from the laboratory. Quite frequently, however, it will be necessary to start the infant on a modification in which the proportions of proteids and fats are somewhat lower than they were in the mother's milk previous to weaning; the reason for this being that the proteid of cow's milk is more difficult for the infant to digest than is the same element in human milk. The amount of milk to be given at each feeding will depend in a great measure on the weight of the child and its gastric capacity as represented by its age.

The following table will show the total quantity of food and the relative proportions of fat, sugar, and proteid which a healthy infant can take from birth until the eighteenth month:

AGE.	FAT.	SUGAR.	PROTEIDS.	DAILY QUANTITY.	
	Per cent.	Per cent.	Per cent.	Ozs.	Grams.
1st and 2d day,		5.0		4-8	125- 250
3d to 7th day,	2.0	6.0	0.60	10-15	310- 460
2 to 4 weeks,	2.5	6.0	0.80	20-30	620- 930
1 to 3 months,	3.0	6.0	1.00	22-36	680-1110
3 to 4 months,	3.5	6.0	1.25	28-38	870-1180
4 to 6 months,	4.0	6.0	1.50	32-38	990-1180
6 to 9 months,	4.0	7.0	2.00	34-42	1050-1300
9 to 12 months,	4.0	6.0	2.50	38-45	1180-1400
12 to 15 months,	4.0	5.0	3.00	40-50	1240-1550
15 to 18 months,	4.0	5.0	3.50	45-50	1400-1550
18 months,	3.5	4.3	4.00	45-50	1400-1550

Ssnitkin's investigations show that $\frac{1}{100}$ of the initial weight, plus one gm. for each day of life, should be taken as the figure with which to begin the calculation of the relative weight of a child to its gastric capacity.

Illustration of Ssnitkin's rule to aid in adjusting the food to especially difficult cases in the first thirty days:

INITIAL WEIGHT.	AMOUNT AT EACH FEEDING.		
	Early Days.	At 15 Days.	At 30 Days.
3000 grams, . . .	30 grams (about 1 oz.).	$30 + 15 = 45$ grams (about $1\frac{1}{2}$ oz.).	$30 + 30 = 60$ grams (about 2 oz.).
4500 grams, . . .	45 grams (about $1\frac{1}{2}$ oz.).	$45 + 15 = 60$ grams (about 2 oz.).	$45 + 30 = 75$ grams (about $2\frac{1}{2}$ oz.).
6000 grams, . . .	60 grams (about 2 oz.).	$60 + 15 = 75$ grams (about $2\frac{1}{2}$ oz.).	$60 + 30 = 90$ grams (about 3 oz.).

Where the child's digestion is weak, the proportions of the various constituents of the milk, especially the fats and proteids, may have to be changed several times before a modification can be made which will suit for permanent use. As the child's digestive apparatus becomes stronger, the proportions of proteids and fats may be gradually increased until the following proportions are obtained:

Fat,	3 per cent.
Sugar,	6 "
Proteids,	1 "

The preparation should be made slightly alkaline and heated to a temperature of 167° F. (75° C.). This formula will represent about the average constitution of human milk with a rather low percentage of proteids. If the infant seems to thrive on this and continues to gradually gain in weight, the proportion of fats and proteids may be slowly raised until by the time it has reached the tenth or eleventh month of life it is taking pure cow's milk. This should have enough lime-water added to make it somewhat alkaline in reaction, and should be heated to about 167° F. (75° C.). The weight of the infant and the state of its digestion are points which must guide us as to whether any particular modification is doing well. There are certain general symptoms in the infant which will guide our knowledge as to whether or not the milk is doing all that is required of it. Where the percentage of fat is too high, the child will have frequent regurgitation of food in small quantities, these usually appearing an hour or two after feeding. The bowel movements are frequent and sometimes of

normal appearance, but in some cases they may contain small round lumps resembling casein, but which are really composed of fat. Not infrequently, also, the child will give evidence of suffering from colic.

Where the child is receiving too little fat, the bowels are constipated and the stools dry and hard. Where the amount of sugar is in excess, there will be frequent eructations of gas from the stomach and regurgitation of small quantities of milk. Colic will also be present, and the stools are apt to be green, thin, and very acid, often causing severe irritation of the buttocks. In cases where the percentage of sugar is too low, the gain in weight is slow or absolute loss of flesh may be noticed. Where the proportion of proteids is too high, the infant cries a great deal because of colic, and constipation is the rule, although occasionally there may be short attacks of diarrhea, the stools containing masses of curd. Vomiting is frequent, the vomited matter containing curds of varying size. Imperfect digestion of proteids may cause much the same symptoms as when this element is in excess, as indeed it really is too great in proportion to the digestive capacity. A general excess of food may produce very much the same symptoms as where the individual elements are in excess. Holt has summarized the indications for modification of the various constituents of milk as follows:

If the child is not gaining in weight without special signs of indigestion, increase the proportions of all the ingredients. If habitual colic is present, diminish the proteids. If vomiting appear very soon after feeding, reduce the quantity of food given. For the regurgitation of sour masses of food, reduce the fat and sometimes the proteids. For obstinate constipation increase both fats and proteids.

Home Modification.—The question of the modification of milk at home is one of much importance and interest. By even a slight study of this subject the practitioner will often be able to restore to health many infants who do not need drugs to help them, and who are not sick but starving. It is not necessary that a child should be without food to starve; many children perish every year while being given plenty of nourishment, as far as quantity goes, the food being of such quality as to be either not digested at all or only partially digested; the most of it remaining in the stomach and intestines subject to fermentation and setting up later acute or subacute forms of

fermentative diarrhea. At first sight the method for the scientific modification of milk, such as has been placed before the profession by the careful labors of Roteh and others is, so far as the technic goes, a rather difficult one, and yet a little study of the subject will show it to be not so perplexing as at first sight; and even the busiest of practitioners can, in a short time, obtain a knowledge of infant feeding which will enable him to instruct the mother as to the needs of the patient, and to make a food much better because nearer in composition to the child's natural diet than any of the proprietary foods so commonly used.

There are several methods by which milk can be modified at home, none of them being very complex. We give, however, only those which are the simplest and best adapted for ordinary use.

Holt's Method.—This plan of modification, which is somewhat more complicated than one which will be given later, is as follows:

It is essential to have on hand the elements from which the desired formulæ can be compounded. *First*, for the fat it is necessary to have one of the following preparations of cream: (*a*) a twelve per cent. cream, *i. e.*, one that contains twelve per cent. of fat. This may be obtained by using equal parts of the ordinary twenty per cent. centrifugal cream, and plain milk; or (*b*) by using two parts of ordinary skimmed or gravity cream (such as would be produced by allowing milk to set over night) containing sixteen per cent. of fat mixed with one part of plain milk. *Second*, an eight per cent. cream. This may be obtained by using (*a*) one part of twenty per cent. centrifugal cream and three parts of plain milk; or (*b*) by using one part of gravity cream and two parts of plain milk; or (*c*) using the top layer from milk which has been standing five or six hours.

The following solutions of sugar: A 5 per cent. solution made by dissolving 1 ounce of milk-sugar in 20 ounces of water, or 1 even tablespoonful in $7\frac{1}{2}$ ounces of water (1 even tablespoonful represents 3 drams). A 6 per cent. solution: 1 ounce of milk-sugar is dissolved in $16\frac{1}{2}$ ounces of water, or 1 even tablespoonful in $6\frac{1}{2}$ ounces of water. A 7 per cent. sugar solution: 1 ounce of sugar is dissolved in 14 ounces of water, or 1 even tablespoonful in $5\frac{1}{2}$ ounces of water. An 8 per cent. sugar solution: 1 ounce is dissolved in $12\frac{1}{2}$ ounces of water, or 1 even tablespoonful in $4\frac{1}{2}$ ounces of water. A 10 per cent. sugar solution, twice the strength of a 5 per cent. solution.

Other Articles Needed.—Some freshly-prepared lime-water, some filtered water which has been boiled fifteen minutes, several nursing-bottles, preferably of cylindrical shape and graduated to ounces and drams, plain rubber nipples, some absorbent cotton. The method of preparing the milk is as follows: The first thing is to decide the proportion of each of the elements to be used; (2) the number of feedings in the twenty-four hours; (3) the quantity for each feeding. Suppose we wish the formula to contain three per cent. of fat, six per cent. of sugar, and one per cent. of proteids, and we require nine feedings of four ounces each, it is necessary to prepare thirty-six ounces of food. In order to make up this formula, the following proportions of the various elements are necessary:

Centrifugal cream, . . . 4½ ozs. }	or	{ Skimmed cream, . . . 6 ozs.
Plain milk, 4½ “ }		{ Plain milk, 3 “
Milk-sugar, 2 “	or	5½ even tablespoonfuls.
Boiling water, 25½ “ }	or	{ Boiling water, 27 “
Lime-water, 1½ “ }		{ Bicarbonate of soda, . 36 grains.

The sugar is to be dissolved in boiling water and filtered through cotton and allowed to partially cool. The milk and cream should next be added, and the whole mixed in a pitcher, after which the alkaline liquid (either lime-water or a solution of bicarbonate of soda) or plain sterilized water is to be added. The mixture is now to be divided into nine bottles, the mouths of which should be stopped with cotton. The bottles should next be placed in a sterilizer for pasteurization or sterilization according to directions. Otherwise they should be cooled by standing in cold water for fifteen minutes, during which time the temperature of the water is to be reduced by the addition of ice. The food should be kept in an ice chest until time for use, when it should be heated slightly by placing in warm water. The principal fault to be found with this method is the variety of proportion in the ingredients used. To be able to combine these in definite ratio so as to make an accurately-compounded milk formula requires no little study and calculation.

Rotch's Method.—Rotch has devised a much more simple method for the modification of milk at home. The articles required are as follows: A wide-mouthed glass jar holding one quart, a siphon of glass tubing, ¼ to ½ of an inch in diameter, and bent so that the

end out of which the milk is to flow is six inches longer than that which is inserted in the jar.

One quart of fresh milk from a herd of cows is thoroughly strained and put into the jar, which is kept open for fifteen minutes in order to allow it to cool. The jar is then sealed tightly, and placed in a vessel containing ice water and salt, in the proportion of a teaspoonful of salt to a quart of water. This is set in a cool place for six hours. At the end of this period siphon out from the bottom of the jar $\frac{3}{4}$ of the milk into a clean vessel. The mouth must not be used to start the flow of the milk through the siphon, but the latter must be filled with clean boiled water, the longer end closed with the finger and the siphon inverted, the shorter end being placed in the milk. When the finger is withdrawn the water followed by the milk will run out of the longer division.

The materials necessary for preparing the milk mixture are as follows:

1. The milk which has been siphoned from the jar.
2. The cream which remains in the jar and which contains ten per cent. of fat.
3. Milk-sugar. This may be purchased by the pound and divided by the druggist into packages each containing $3\frac{3}{8}$ drams (200 grs.), or a measure containing $3\frac{3}{8}$ drams may be made.
4. Some lime-water.
5. Some well-boiled and filtered drinking water.

The milk-sugar is first to be dissolved in the water and the other ingredients then added.

The following tables are prepared by these rules:

1. LOW PERCENTAGE OF FAT AND PROTEIDS.

Proteids,	0.25	Cream,	$\frac{1}{2}$ oz.
Fat,	0.25	Milk,	1 "
Sugar,	4.00	Lime-water,	1 "
Lime-water,	5.00	Water,	$17\frac{1}{2}$ ozs.
			<hr/>
			20 ozs.
		Milk-sugar,	2 measures.

2. LOW PERCENTAGE OF FATS AND PROTEIDS.

Proteids,	0.75	Cream,	2	ozs.
Fat,	1.00	Milk,	2	"
Sugar,	5.00	Lime-water, . . .	1	oz.
Lime-water,	5.00	Water,	15	ozs.
				20 ozs.
		Milk-sugar, . .	2	measures.

3. FOR WEANING.

Proteids,	3.50	Cream,	8	ozs.
Fat,	4.00	Milk,	12	"
Sugar,	4.50			20 ozs.

4. FOR WEANING.

Proteids,	3.25	Cream,	8	ozs.
Fat,	4.00	Milk,	8	"
Sugar,	5.00	Lime-water, . . .	1	oz.
Lime-water,	5.00	Water,	3	ozs.
				20 ozs.
		Milk-sugar, . .	$\frac{7}{8}$	measure.

5. FOR WEANING.

Proteids,	3.00	Cream,	8	ozs.
Fat,	4.00	Milk,	$7\frac{1}{2}$	"
Sugar,	5.00	Lime-water, . . .	1	oz.
Lime-water,	5.00	Water,	$3\frac{1}{2}$	ozs.
				20 ozs.
		Milk-sugar, . .	1	measure.

6.

Proteids,	3.00	Cream,	8	ozs.
Fat,	4.00	Milk,	$7\frac{1}{2}$	"
Sugar,	7.00	Lime-water, . . .	1	oz.
Lime-water,	5.00	Water,	$3\frac{1}{2}$	ozs.
				20 ozs.
		Milk-sugar, . .	2	measures.

7.

Proteids,	1.00	Cream,	4	ozs.
Fat,	2.00	Milk,	$1\frac{1}{2}$	"
Sugar,	5.50	Lime-water, . . .	1	oz.
Lime-water,	5.00	Water,	$13\frac{1}{2}$	ozs.
				20 ozs.
		Milk-sugar, . .	$2\frac{1}{4}$	measures.

8.	
Proteids,	1.00
Fat,	2.50
Sugar,	6.00
Lime-water,	5.00
Cream,	5 ozs.
Milk,	None.
Lime-water,	1 oz.
Water,	14 ozs.
	20 ozs.
Milk-sugar,	2½ measures.
9.	
Proteids,	1.50
Fat,	3.50
Sugar,	6.50
Lime-water,	5.00
Cream,	7 ozs.
Milk,	1 oz.
Lime-water,	1 "
Water,	11 ozs.
	20 ozs.
Milk-sugar,	2½ measures.
10.	
Proteids,	1.50
Fat,	4.00
Sugar,	7.00
Lime-water,	5.00
Cream,	8 ozs.
Milk,	None.
Lime-water,	1 oz.
Water,	11 ozs.
	20 ozs.
Milk-sugar,	2¾ measures.
11.	
Proteids,	2.00
Fat,	4.00
Sugar,	7.00
Lime-water,	5.00
Cream,	8 ozs.
Milk,	2½ "
Lime-water,	1 oz.
Water,	8½ ozs.
	20 ozs.
Milk-sugar,	2½ measures.
12.	
Proteids,	2.50
Fat,	4.00
Sugar,	7.00
Lime-water,	5.00
Cream,	8 ozs.
Milk,	5 "
Lime-water,	1 oz.
Water,	6 ozs.
	20 ozs.
Milk-sugar,	2¼ measures.

In some cases barley water may be used with advantage in place of lime-water or in combination with it. The special indications for this will be mentioned later.

Gaertner, in his "*Fettmilch*" or mother's milk, aims to reduce the excess of casein in cow's milk by the use of the following method :

A separator, known as the Pfanhauser centrifuge, making 4800 revolutions a minute, is employed. The machine is filled with equal parts of fresh cow's milk and sterilized water. The speed of the centrifuge is regulated so as to separate the mixture into (1) creamy fatty milk, (2) skimmed milk. The two portions are led off by as many openings. An analysis of each of these portions shows that the creamy milk has the same quantity of fat as is found in human milk. About two per cent. of the casein is contained in the skim milk, and the balance, 1.7 per cent., remains in the creamy milk. In order to bring up the proportion of sugar to that found in human milk about three or four gm. of milk-sugar are added to every 100 c.c. of the fat milk. It is claimed that the fat milk has the advantage over diluted milk of having a higher percentage of fat while the curd is rendered more digestible.

Predigestion.—In order to predigest milk, several methods have been resorted to. Probably the most successful consists in the use of an amount of extract of pancreatin relatively small in proportion to the amount of milk. This is used simply to start the process of predigestion, the process being then arrested by quickly raising the temperature of the milk to a degree sufficient to destroy the ferment. By this method the milk shows less readiness to curdle by the addition of rennet or an acid, and the curd thrown down is in smaller particles and softer than that found in fresh cow's milk. It should be borne in mind in feeding a child on predigested food, that while this form of nourishment acts very well for a short time in children with weak digestion, yet a long-continued course of such foods will predispose the patient to rickets or scurvy, particularly if the milk has been subjected to the longer method of sterilization.

CHAPTER VI.

DIET OF CHILDREN.—ARTIFICIAL FOODS.— RECIPES, ETC.

DIET FROM SIX MONTHS TO ONE YEAR.

By the eleventh or twelfth month the capacity to digest starch is fully developed. After this period of life, sugar as such is not the only heat-producing food, in fact, it becomes secondary in importance to starch in this capacity. It must not be supposed that the power of digesting sugar is any less, but as starchy foods can be taken and assimilated, the need for sugar is not so great. Following out this principle, we can with propriety introduce into the child's diet toward the end of the first year of life various starchy foods, and it is best that we use for the purpose articles which contain this element in its simplest form. Various proprietary foods have been put upon the market for infant feeding during all periods of life. These should not, except in very unusual cases, be given to a child before the eleventh or twelfth month, and it is doubtful if even then they are of as much use as some simpler form of starch such as is contained in oats or wheat and which can be readily prepared by the mother or nurse. During the period of life now under consideration, milk must still be the principal article of diet; the amount of proteids and fats may be increased and the quantity of sugar gradually diminished, substituting in place of this latter element some form of starchy diet. Probably the simplest form of introducing the latter is by the use of oat or barley jelly (the former contains slightly more starch than the latter, while both contain a certain per cent. of fat). Oat or barley jelly can be made in the following manner: Four ounces (120 gm.) of coarse oatmeal are allowed to soak in a quart of cold water for twelve hours. The mixture is then boiled down so as to make a pint. It is then, while hot, strained through a fine cloth. Barley jelly is

made in practically the same way. As the age of the child increases, the quantity of food given should be increased in proportion, and between the twelfth and thirteenth months five meals a day may be given.

Proprietary Foods.—Many of these foods seem to be quite carefully prepared, and, having the advantages of convenience and cheapness, may be introduced with good results by the end of the first year. It has been taught by some authorities that finely-divided starch or dextrin introduced into milk acts in two different ways: First, by its nutrient properties, and, secondly, by its mechanical action. By mechanical action was meant that it was supposed the particles of the starch or dextrin so diffused themselves among the globules of fat and casein of the milk, that the former were prevented from separating from the emulsion and the latter could not form a tough curd in the digestive tract of the child. This theory has of late years been disputed, and experiments seem to prove that the action of these substances as attenuants, so called, is of little consequence. As far as their nutritious properties are concerned, the starchy or dextrinized foods are far inferior to milk, for two reasons: First, the proportion of tissue-building to the heat-producing elements is much below that of milk. In the second place the starch, which is a heat-producing principle, must be converted into sugar before it can be absorbed. This change is accomplished by the action of the pancreatic juice and saliva, neither of which are to any extent established before the fourth month of life. The undigested starch, therefore, remains in the gastro-intestinal canal and is extremely likely to cause fermentation. In order to make up in some degree for their lack of nutritive properties, all farinaceous foods should be prepared with milk, and it really becomes a question whether, in infants under eight or ten months of age, the nutritious principles are not dependent much more on the milk than on the food itself. In regard to proprietary foods it may be said that their best quality is that they form an easy and convenient way of introducing starch or partially dextrinized starch into some modification of milk.

Dextrinized Foods.—Many preparations are sold in which, by previous heating or by digestion with diastase, wheat- or barley-flour is so modified as to be more easily digested than simple starch. By the action of a temperature of 300° or 400° F. the principal substance

starch, forms dextrin, a body differing from starch in the fact that it is soluble and has the characteristics of a gum. Quoting from the investigations of Prof. Leeds, we find that the flour selected for such treatment should be rich in albuminous substances and made from wheat grown at certain seasons and of a certain grade, and should be made by the roller process.

Liebig's Foods.—Under this head may be classed a number of proprietary foods the essential construction of which is as follows: The flour is prepared by means of diastase, equal parts of wheat flour and barley malt being used, and a certain amount of wheat bran added. The latter substance is used because of the adherent phosphates and nitrogenous matter. To these one per cent. of bicarbonate of potassium is added, with water sufficient to make a thin paste. This mixture is allowed to stand for several hours at the ordinary temperature, after which the latter is raised to 150° F., and this is continued until all the starch is converted into maltose and dextrin. The mixture is then strained and the residue pressed and exhausted with warm water, after which the extract is evaporated into vacuum pans at a moderate degree of heat. The process is completed by drying at a higher temperature, the mixture being stirred thoroughly. By reference to the table, the composition of many of these foods can be seen.

Dextrinized Foods Intended to be Used Without Milk.—This class of proprietary foods are prepared with the intention of using without the addition of milk, water only being necessary to prepare them for the feeding. In the majority of these the starch, which has been partially or completely converted into dextrin, has been evaporated with milk during their manufacture. An outline of their preparation is somewhat as follows: The flour is first made into dough and baked, after which it is finely ground and mixed with condensed milk, and then dried by a slow heat of moderate degree. In the resulting mixture the starch has been wholly or partially converted into maltose, dextrin, or dextrose. The albuminoids of the flour have undergone about the same changes as take place in other farinaceous foods. The milk-sugar has undergone coagulation and the casein has become dried into a fine powder. An example of this class of foods is the one sold under the name of Nestlé's food. Recently a food known as Eskay's albuminized food has been introduced. The manu-

facturers of this have endeavored to combine egg-albumin with the other constituents. An analysis of this is as follows:

Fat,	4.16
Proteids,	1.76
Total solids,	11.33

In regard to the value of these foods we must say that there is no one of them that can be referred to as being the best upon which to feed a large number of children or a single child during a long period of time. That they have a certain amount of usefulness can not be doubted.

TABLE OF THE CONSTITUENTS OF LIQUID FOODS AND PEPTONIDS.

(From Bulletin No. 10, Department of Agriculture.)

NAME OR BRAND.	WATER.	FAT.	PROTEIN.	CARBOHYDRATES.		FIBER.	ASH.	REMARKS.
				Soluble.	Insoluble.			
Beef peptonoids (dry), .	4.91	3.49	63.18	. . . . .	. . . . .	. . . . .	3.54	Sp. gr. 1.049.
Bovinine,	62.18	Trace.	15.35	. . . . .	. . . . .	. . . . .	4.30	Contains alcohol and boracic acid.
Bovox,	52.23	Trace.	24.49	. . . . .	. . . . .	. . . . .	2.18	Sp. gr. 1.020.
Murdock's liquid food,	75.81	0.11	12.91	. . . . .	. . . . .	. . . . .	5.27	Sp. gr. 1.244, contains alcohol.

FOODS FOR INFANTS AND INVALIDS.

Carnrick's soluble food,	3.12	6.26	16.32	56.62	14.44	0.22	3.02	
Horlick's food,	3.64	2.01	11.28	63.14	17.28	0.73	1.92	
Horlick's malted milk,	2.87	7.81	16.61	59.43	10.95	0.52	1.81	
Hubbell's prepared wheat,	5.93	1.19	14.81	16.16	60.86	0.31	0.44	
Imperial granum, . . .	10.57	1.32	19.37	15.42	51.88	0.31	1.13	
Just's dietetic food, . .	4.83	0.79	3.85	70.60	18.31	0.51	1.11	
Lactopreparata,	3.28	6.26	22.48	58.89	7.21	0.81	1.07	
Liebe's soluble food, . .	22.03	0.08	3.32	76.38	. . . . .	. . . . .	1.41	
Mellin's food,	3.93	2.04	11.87	59.45	17.71	0.53	4.47	
Milkine,	2.74	7.12	13.37	61.19	13.63	0.63	1.32	
Nestlé's food,	2.37	4.94	11.04	43.75	35.73	0.47	1.61	
Nursing meal,	10.84	2.36	6.22	44.66	32.96	0.63	2.31	Contains cocoa.
Nutrico food,	11.87	4.38	13.10	9.75	57.83	0.61	1.77	
Ridge's food,	8.87	1.67	13.37	8.32	66.35	0.81	0.61	
Wagner's infant food, .	5.07	10.91	14.81	37.91	28.91	0.37	2.01	
Wells, Richardson & Co.'s lactated food, .	2.94	2.67	13.22	28.84	48.45	1.37	2.51	
Zimmerman's health food,	6.79	1.33	11.16	14.73	63.97	0.71	1.31	

Simple Attenuants.—The principal use of these is to dilute the milk and at the same time add somewhat to its nutritious property. Many of them have a slight therapeutic action upon the intestinal tract of the child. Of those in use, probably the best are barley water, gelatin water, and oatmeal water.

Barley water can be made as follows: Into a saucepan containing a pint of water put two teaspoonfuls of washed pearl barley, boil slowly down to $\frac{2}{3}$ of a pint and strain.

Gelatin water: Put a piece of plate gelatin an inch square into half a tumblerful of cold water, and let it stand for three hours. Then turn the whole into a teacup, and place this in a saucepan half full of water, and boil until the gelatin is dissolved. One or two teaspoonfuls of this should be added to about four ounces of water. When made with milk, about the same quantity of the jelly is to be used to each bottle containing eight ounces.

Oatmeal water: To a pint of water add from one to three tablespoonfuls of well-cooked oatmeal; heat until it has almost reached the boiling-point, and stir constantly.

Lime-water: A piece of unslaked lime the size of an English walnut should be dropped into two quarts of boiled or filtered water contained in an earthen vessel; the water is then stirred thoroughly and allowed to settle. The water should be used only from the top and should be replaced as consumed.

Condensed Milk.—Condensed milk is largely used, especially by the poorer classes as an article of food for infants. Being sealed in air-tight cans or jars and containing a large quantity of sugar, it is easily preserved for a considerable time. It is also cheap and prepared with comparatively little trouble—both qualities which will recommend it to the poor mother with the cares of a large family. All that is necessary for its preparation is to mix with a certain quantity of water and pour into a nursing-bottle. Regarding the relative proportions of the principal elements of condensed milk, Professor Leeds, of Hoboken, found in the analysis of a large number of specimens the following proportions of its constituents:

	MILK CONDENSED WITH CANE-SUGAR ADDED. No. I.	THE SAME DILUTED WITH EIGHT TIMES ITS WEIGHT OF WATER.
Fat,	12.10	1.51
Albuminoids,	16.07	2.01
Lactose,	16.62	2.08
Sucrose,	22.26	2.78
Ash,	2.61	0.32
Total solids,	69.66	8.70
Water,	30.34	91.30
	100.00	100.00

	ANGLO-SWISS MILK, PRESERVED WITHOUT ADDED SUGAR. No. II.	AMERICAN-SWISS, PRESERVED. No. III.
Fat,	13.21	11.55
Albuminoids,	11.36	14.10
Lactose,	15.29	13.04
Sucrose, . . . . .	. . .	. . .
Ash,	1.78	2.09
Total solids,	41.64	40.78
Water,	58.36	59.22
	100.00	100.00

SAME AS III, DILUTED WITH
FIVE TIMES ITS WEIGHT
OF WATER.

Fat,	2.64
Albuminoids,	2.27
Lactose,	3.05
Sucrose,	
Ash,	0.36
Total solids,	8.32
Water,	91.68
	100.00

TABLE SHOWING THE CONSTITUENTS OF EVAPORATED CREAMS
AND UNSWEETENED CONDENSED MILKS.*

NAME OF BRAND.	WATER. Per cent.	FAT. Per cent.	PROTEIN. Per cent.	MILK- SUGAR. Per cent.	CANE- SUGAR. Per cent.	ASH. Per cent.
EVAPORATED CREAMS.						
First Swiss,	62.72	10.68	9.23	13.72	. .	2.04
Highland,	68.75	9.63	9.21	10.89	. .	1.52
Howell's,	71.92	8.81	8.53	8.82	. .	1.82
Imperial,	69.54	9.56	8.61	10.42	. .	1.87
Loeflund,	68.37	7.81	10.17	11.84	. .	1.81
Monroe,	69.64	8.91	9.54	10.44	. .	1.47
Roman shorn,	66.28	10.39	9.77	11.47	. .	2.09
St. Charles,	66.46	9.20	10.49	12.24	. .	1.55
CONDENSED MILKS.						
Anglo-Swiss,	21.56	9.37	9.16	13.39	40.45	2.07
Baby,	22.99	10.61	9.01	14.24	40.17	2.08
Dime,	23.88	7.34	10.07	12.70	43.95	1.96
Full Weight,	25.58	9.20	9.44	11.71	42.14	1.84
Gail Borden "Eagle,"	30.16	7.51	8.40	9.82	42.24	1.87
Good Luck,	27.11	8.29	9.03	12.74	40.87	1.98
Jersey,	24.25	9.86	8.44	12.33	43.19	1.93
Leader,	22.66	9.73	9.23	12.98	43.44	1.96
Magnolia,	25.58	8.04	8.21	10.68	45.48	2.01
Milk-maid,	25.76	9.03	9.33	10.18	43.72	1.98
Nestlé,	24.20	9.81	10.49	11.66	41.63	2.21
Percelain,	24.43	7.01	10.42	12.63	43.80	1.71
Red Cross,	25.97	7.93	8.91	11.93	43.77	1.49
Red Star,	25.55	9.74	9.38	10.87	42.31	2.13
Rival,	21.63	9.36	8.72	11.81	46.61	1.87
Sweet Clover,	24.51	8.31	8.75	11.88	44.58	1.97
United States,	30.29	7.21	8.74	12.04	39.80	1.92

It will be seen by a glance at these tables, that while the proportion of lactose and cane-sugar in condensed milk is in excess of that found in human or cow's milk, yet the amount of fat and proteid, as well as the alkaline mineral matters, are considerably less. It is true that the large amount of sugar present tends to prevent constipation, but the other elements being disproportionately small makes condensed milk, as an article of food, deficient in its general nutritive properties.

Children fed on condensed milk soon become fat, and for some time the digestion really seems to be improved; this is more frequently the case if the child is changed to a diet of this substance from one

* From Bulletin No. 10, Department of Agriculture.

of farinaceous foods. After a continued diet of condensed milk, however, a child generally becomes flabby, restless, or sleepy, suffers from impaired digestion with considerable fermentation, and is apt, sooner or later, to drift into a condition of marasmus. Some of the worst cases of simple atrophy that we have ever seen have been those in which the infants have been fed for a long time on this form of diet. In these children, also, the period of dentition comes later, is irregular and prolonged, and a strong tendency to rickets or a chronic state of malnutrition is manifest. It has also been noticed that if children fed on this diet fall into a subacute diarrhea, it is almost impossible to save their lives.

DIET OF CHILDREN FROM THE SIXTH TO THE EIGHTEENTH MONTH.

From the end of the first year of life a child should receive about five meals a day. The first to be given about 7 o'clock in the morning and should consist of eight ounces of modified milk made in the following proportions :

<i>Percentage.</i>		<i>By Measure.</i>	
Fat,	4 per cent.	Milk,	6 ozs.
Sugar,	5 "	Cream,	1 oz.
Proteids,	3 "	Water,	3 ozs.
		Sugar of milk,	two even teaspoonfuls.

This may be varied by the use of barley- or oatmeal-jelly in the same proportion as the water. At the second meal much the same quantity of milk may be given, or at this feeding from one to two tablespoonfuls of one of the standard proprietary foods may be used. Starr recommends the use of a preparation known as flour ball, which, by its simplicity of preparation, should be recommended. It is made as follows: A pint of wheat flour of good quality, without bran, is tied tightly in a pudding bag. This is placed in a saucepan of water and boiled constantly for ten hours. It is then allowed to cool, the bag removed, and the outer covering of dough cut away. The yellowish-white interior of the mass consists almost entirely of dextrin, which has been formed from the starch during the process of cooking. This interior is reduced to a powder by grating. To prepare for use in a

nursing-bottle. rub a teaspoonful of the powder with a tablespoonful of milk until a smooth paste is formed; a second tablespoonful of milk is now added, with constant rubbing. This quantity should be poured into eight ounces of hot milk, the milk being continuously stirred while the paste is poured in.

By the fifteenth month. the child, providing it is still on a diet of modified milk, may be given a formula such as the following:

<i>Percentage.</i>	<i>By Measure.</i>
Fat, 4 per cent.	Milk, 8 ozs.
Sugar, 5 "	Cream, $\frac{1}{2}$ oz.
Proteids, 3.5 "	Water, $1\frac{1}{2}$ ozs.
	Sugar of milk, one even teaspoonful.

Occasionally the diet may be varied by giving the child at one of the feedings a small quantity of whey. This is prepared as follows: A pint of milk is warmed, and two teaspoonfuls of Fairchild's essence of pepsin are added. The mixture is then allowed to stand until the process of coagulation of the curd is completed. It is then beaten with a fork until the curd is finely subdivided, after which it is strained.

Sometimes a small quantity of animal food may be introduced into the child's diet with benefit; this is particularly the case where an attack of indigestion supervenes. Beef extract or thin beef or mutton broth can be used for this purpose. Beef juice is prepared in the following manner: A pound of beef sirloin should be warmed in a broiler before a quick fire; it should then be cut into small pieces and placed in a lemon squeezer or meat press, so as to express the juice, which is caught in a hot cup. All fat should be removed. Care should be taken not to cook the meat.

Beef Broth.—One pound of lean beef should be minced finely and put with its juice into an earthen vessel containing a pint of water at 85° F. It should then be allowed to stand for one hour, after which it is strained, preferably through stout muslin, until all the juice is removed from the meat. The liquid is then placed on the fire and slowly heated just to the boiling-point, being stirred all the time; it is then removed and seasoned with salt.

Mutton broth is prepared by gently boiling one pound of loin mutton in three pints of water until the meat is tender; a little salt should then be added and the whole strained into a basin; skim off

the fat as soon as cold. Both beef and mutton broth should be warmed before giving it to the child.

A child of eight or nine months can occasionally be given the yolk of an egg lightly boiled and mixed with stale bread crumbs, or a small quantity of a well-roasted potato may be given for one meal a day once or twice a week. Where broths are used, they should be given in quantities of about four or five ounces, either plain or mixed with bread crumbs or finely-crumbled Zwieback. Chicken broth may also be used at this time of life as an occasional substitute for milk or Liebig's food prepared with milk. *Chicken broth* is made in the following manner: A small chicken or half of a large one, after being thoroughly cleaned and having all the fat and skin removed, is chopped into small pieces, bones and all; a pinch of salt is added and the whole is placed in a saucepan, containing a quart of boiling water. The cover of the saucepan should be closed tightly and the contents allowed to simmer over a slow fire for two hours. After removing, allow to stand, still covered, for an hour. The broth is then strained through a sieve. From three to five ounces should be given at one feeding. As a general rule, broths should only be substituted for milk for about one feeding daily two or three times a week.

The diet from the eighth until the twelfth month should be much the same, except that the amounts of nitrogenous and starchy foods may be steadily increased. It should be borne in mind that every young child needs an occasional change of diet. Their *entire* digestive system should be gradually taught to do its duty. The juices of meats, and even the meat itself finely comminuted, may occasionally be given in small quantities as early as the tenth or eleventh month. It is also necessary to impress on the mind of the mother or nurse that the child needs water; this should be given in quantities of an ounce or two at a time; it should be sterilized by some means or other, preferably by boiling, and the child should be encouraged to drink several times a day. The best method of securing pure water is by means of a Pasteur filter attached to one of the faucets in the kitchen, but as this appliance requires water under pressure such as is found in the water system of cities, and is somewhat expensive, it can not be obtained in all households. A very good way to sterilize water is to fill a number of thoroughly-cleaned beer bottles from a hydrant or spring, and after filling the mouth of the bottle

with absorbent cotton, to subject the water to boiling temperature for about half an hour. The cotton may then be removed and the bottle tightly stoppered by means of the gum cork and wire attachment, if the bottle is equipped with a "patent stopper"; otherwise, cork tightly. This water may be given to the child cold, or in the heat of summer even with small pieces of ice in it, or, better, cooled by indirect chilling.

In infants or young children suffering from intestinal disorders, from five to twenty drops of good brandy or whisky may often be added to each drink of water with advantage. In cases of constipation, moderate drafts of oatmeal water, and in cases of diarrhea allowing the child to have frequent drinks of barley water, not only satisfy thirst, but do good in relieving these conditions and are valuable adjuncts in the treatment. Both of these are better thirst quenchers than plain water. All the mineral waters have their uses in the therapeutics of childhood, and in fever cases the effervescent mineral waters, particularly aerated Poland, Apollinaris, or simple soda or Vichy water in siphons, are very refreshing. These should be given in quantities of an ounce or two at a time, and may be at times mixed with a little lemon. Given with cracked ice and with a small quantity of brandy or whiskey added, they are very valuable in many cases of severe vomiting. In the renal affections of childhood aerated waters are serviceable in keeping the kidneys well flushed out, and aiding the excretion of effete products.

DIET OF CHILDREN FROM THE SECOND YEAR.

At the commencement of the second year of life we find the child still needing milk as a chief constituent of its diet. In bottle-fed babies the milk should be modified so that the albuminoids and fats are considerably increased. A useful formula for this age may be prepared as follows:

Milk,	7 $\frac{1}{2}$ fluid ounces.
Cream,	$\frac{1}{2}$ " ounce.
Milk-sugar,	1 dram.
Salt,	a pinch.
Water,	2 fluid ounces.

The child should now be given more of ordinary table diet; either

the white or yolk (the latter preferred) of a soft-boiled egg may be used for one feeding a day. Broths, such as chicken, mutton, or beef broth, should also be used, and a small quantity of finely-chopped or scraped, under-done beefsteak may be given for one or two feedings a day. Some form of animal food should almost always be used at least once a day.

For one or two meals each day, one of Liebig's foods may be given.

At this age five meals a day can be well borne. The first, preferably the above milk formula, should be given about 7 A. M.; the second, which may be omitted if the child is not hungry, should be taken about 11 A. M.; the third, which should be the heaviest meal of the day, may contain the largest amount of animal food. This should be given about 1 or 2 o'clock in the afternoon; the fourth feeding, which may be a repetition of the first, or consist of milk mixed with one of Liebig's foods, should be taken about 6 P. M. Before retiring for the night, the child may take a cup of warm milk rendered slightly alkaline by lime-water or salt.

Toward the end of the second year, a child may receive four meals a day. These should consist of a breakfast composed principally of milk to which a small quantity of thoroughly-cooked oatmeal or wheaten grits, or one or two slices of stale bread, may be added. A child should never receive fresh or hot bread in any form. About 10.30 or 11 o'clock, if the child is hungry, it may receive a tumbler of warm milk. The dinner should be eaten about 1 or 2 o'clock, and at this meal the child may be given a small piece of under-done beef roast or chicken or turkey—any of the lighter meats, in fact. This may be supplemented by one or two vegetables, such as a well-roasted potato mashed with a fork. Such green vegetables as spinach, cauliflower, peas, or string beans may occasionally be used as alternates for potatoes. At this meal also junket, plain rice pudding, good fresh fruits, and occasionally ice cream may be used for desserts. In children with weak digestion a tablespoonful of sherry in water given immediately after the dinner is useful. Tea and coffee should be prohibited, but the child may drink a cup of milk or cocoa with good effect. Bread, not too fresh, may also be eaten with the dinner.

At about 7 P. M. the child should receive its last meal; this may be composed of a slice or two of bread and butter or well-made milk toast. About eight ounces of milk may also be taken at this meal. A small

quantity of some plainly-stewed fruit with the seeds removed is often given with benefit. Unless there are some special indications for it, it is better not to give the child meat at this meal. From this age on the diet of childhood gradually approximates nearer and nearer to that of adult life. It should be remembered that the heaviest meal, the dinner, should be given somewhere near noon. The breakfast and supper should consist largely of milk, although other easily-digested foods, in quantities to suit the child's age, are admissible. It is usually well between breakfast and dinner, and dinner and supper, to give some light food, such as milk, since the intervals between the time of adults' meals are rather too long for the youthful digestive organs to run without some nourishment being supplied. It is advisable to allow no candies or cakes at all, and thus prevent the child acquiring a taste for them. If this is impossible, such things should be permitted only immediately after a meal, and better only as a special reward for good conduct.

CHAPTER VII.

DISEASES OF THE DIGESTIVE ORGANS.

Of all the diseases of young children with which the physician comes in contact, those referable to a defective digestion will form considerably more than half. In the infant under a year old, and in the young child up to the period of complete dentition, these diseases are found more commonly than any other. The very young child is not so susceptible to acute fevers as older children; they are, of course, not prone to contract the various ailments peculiar to adult life, so that we find that dentition, and the various pathologic conditions associated therewith (all of which are exaggerated by diseased states of the digestive tract), and the acute and chronic affections of the stomach and intestines will cause the largest amount of work for the physician during these earlier years of child life. It is of special importance, therefore, that the physician who attempts to treat the various diseases in children shall be at least moderately conversant with the disorders affecting the digestive tract of children and the causes on which these diseases chiefly depend.

THE MOUTH.

This orifice plays a very important rôle in the differential diagnosis of the acute exanthemata, on account of the fact that a number of eruptions make their appearance in the mouth from two to three days before developing in other parts of the body. In healthy newly-born infants the mucous membrane of the mouth is of a pink color, with a very slight secretion of saliva. This continues for the first two or three months of life, toward the end of which time the secretion becomes gradually increased in quantity because of the higher development of the salivary glands. Frequently small flocculi or curds of milk may be seen, and occasionally these must be differentiated from the ulcerative patches of stomatitis or of thrush. As the

epithelium of the mucous membrane is exceedingly delicate, it can be easily injured, and may become a point of entrance for bacteria, thus setting up some form of infective disease.

DISEASES OF THE MOUTH.

STOMATITIS.

Varieties.—(1) Simple catarrhal stomatitis; (2) Aphthous stomatitis; (3) ulcerative stomatitis; (4) stomatitis mycosa, or parasitic stomatitis; (5) gangrenous stomatitis; (6) diphtheric stomatitis; (7) syphilitic stomatitis; (8) mercurial stomatitis.

(1) SIMPLE CATARRHAL STOMATITIS.

Catarrhal stomatitis consists of a hyperemic condition of the mucous membrane of the mouth, with more or less alteration of its secretion.

Causes.—The causes may be primary or secondary. Among the primary causes are: traumatism to the mucous membrane, by too vigorous attempts at cleansing the mouth, by the food being too hot, in older children by sharp teeth, or by an irritation or abscess in the gum. As secondary causes we have the various gastro-intestinal diseases, teething, eruptive fevers, and quite frequently whooping-cough. Stomatitis is often found in healthy children as well as in those who are sickly.

Symptoms.—Preceding the onset of the inflammation in the mouth we may have a slight rise of temperature, some vomiting, constipation—symptoms, in fact, showing the onset of any acute disease. In a short time there will be pain in the mouth or throat, these symptoms occasionally being accompanied by enlargement of the lymphatics under the jaw and in the neck. A slight cough not infrequently forms an accompaniment. These symptoms are quickly followed by soreness of the mucous membrane of the mouth which becomes more and more localized, with increased salivation and fetor of the breath.

Where the stomatitis is general, the lips share in the inflamma-

tion, becoming swollen and tense. A fine papular eruption, caused by the engorgement of the muciparous follicles of the lips, is often seen. The tongue is coated, sometimes slightly swollen.

Treatment.—A method of treatment often pleasant to the patient consists in the application of cold sterilized water to the interior of the mouth by means of cotton fastened to a stick. The action of these applications can be increased by the addition of boric acid in a strength of from two to three per cent. Weak solutions of sulphate of zinc or salicylate of soda in a strength of about one per cent. are useful remedies. The agent most generally used, and usually with excellent effect, is nitrate of silver in a strength of about a half to one and a half per cent.

Applications of alum, made by gently touching the inflamed spot with a single crystal, sometimes gives good results. The food should be bland and all condiments avoided. It is often more grateful to the patient to have the food given cold. Attention should be directed to the digestion, and the bowels kept open by laxatives.

(2) APHTHOUS STOMATITIS.

Synonyms.—VESICULAR STOMATITIS, FOLLICULAR STOMATITIS, AND APHTHOUS SORE MOUTH.

Aphthous stomatitis consists in a hyperemia of the mucous membrane of the mouth accompanied by the formation of small superficial ulcers.

Causes.—Aphthous stomatitis is most common from the tenth to the thirteenth month of life, although it may occur at any age. The direct causes are rather obscure, although micro-organisms would seem to play an important part in the etiology. Siegel describes an ovoid bacillus 0.5μ in length, which he found in the buccal secretion taken from patients seen during an epidemic in Germany. The disease frequently follows gastro-intestinal diseases, acute fevers, and pneumonia. Preceding the inflammation of the mouth the symptoms of high fever, increased salivation, vomiting, and constipation—in fact, the same symptoms which may precede any of the acute fevers—may be present. The heat and pain in the mouth increase and there may be some enlargement of the lymphatics. The inflammation of the mouth soon localizes itself into small ulcers of round or oval shape and of yellowish-white color, each ulcer being surrounded by a

red areola. The ulcers may appear simultaneously, or they may come in successive crops.

Treatment.—The treatment consists in opening the bowels with a gentle laxative and regulating the diet. In this form of stomatitis, applications of chlorate of potassium, in the strength of 20 to 25 grains to the ounce, seems to work remarkably well. The cause of the inflammation, so far as possible, should be removed; the roots of decayed teeth should be taken out, and diseased teeth attended to. The local treatment consists in the application of chlorate of potassium or silver nitrate. Since many of the children affected by this disease are in poor general health, tonics, such as the various preparations of iron and quinin, are indicated. Where the mouth is so sore that food can not be taken in this way, nutritive enemata should be used. The irritation caused by the highly acid secretion of the mouth may be relieved by gently washing out with a solution of borax or bicarbonate of soda. The mouth must be kept clean, but it should be borne in mind that all applications must be applied with great care.

A form of aphthous stomatitis only found in the new-born and described under the name of Bednar's aphthæ, consists in a number of shallow ulcers covered by a gray or yellowish coating, which are found upon the soft palate and the posterior part of the hard palate. This form of aphthæ is always produced by a too violent cleansing of the mouth, although it is occasionally found resulting from the use of badly-shaped rubber nipples (Forchheimer). The treatment consists in the application of bland antiseptic washes.

(3) ULCERATIVE STOMATITIS.

“This is a peculiar process, characterized by destruction of tissue, beginning on the gums around the teeth, never extending beyond the mouth, infecting healthy parts of the mouth, and never occurring where there are no teeth.” (Forchheimer.)

Causes.—Ulcerative stomatitis is rarely found in children under five years of age unless produced artificially by such drugs as mercury. It usually occurs in children living in bad hygienic surroundings, particularly where these are associated with poor nourishment. It is occasionally seen following such diseases as scarlet fever or measles, although it is possible for it to occur in any condition in which the health is greatly depreciated. It is generally considered to

be non-contagious. A mild form of ulcerative stomatitis of scorbutic origin is occasionally met with in infants who have been for a long time fed on sterilized milk.

Symptoms.—The disease usually commences with an inflammation of the gums surrounding the incisors, and is most apt to affect those of the lower jaw. The gums become swollen, red, and spongy. In a short time a line of ulcers extends from the point of origin around the gums to the cheek. These ulcers are usually gray in color, although occasionally they are of a yellowish hue. In a short time sloughing of the tissue follows and the teeth become detached from the gums, the resulting cavity being filled with a mucopurulent secretion. The quantity of saliva is increased, and this secretion, becoming mixed with discharges from the ulcers, produces a peculiar fetid odor in the saliva and breath. In very bad cases the maxillary bones themselves, particularly the inferior one, may be attacked. An eczematous eruption may appear around the lips, caused by the irritation of the saliva. The submaxillary lymphatics become enlarged, but this enlargement rarely tends to suppuration.

In very bad cases the tongue and the entire mucous membrane may become affected, and the part of the latter covering the gum of the lower jaw entirely destroyed by ulceration. This is the form of stomatitis which is most commonly associated with scorbutus.

The prognosis depends on the extent of the disease. Where scurvy is the cause, or where any great destruction of bone has occurred, the prognosis is grave.

Treatment.—The treatment is both prophylactic and curative. The prevention of the disease is accomplished by improving, so far as possible, the hygienic surroundings of the patient and by the judicious use of good food and tonics. According to many authorities, chlorate of potassium is regarded as almost a specific in the disease. It should be given in about three per cent. solutions, the effects of the drug being carefully watched. A very good formula recommended by Starr is as follows:

Potassium chlorate,	gr. lvij.
Acid hydrochloric, dilute,	f 5 j.
Syrup,	f 5 ½.
Water, to make	f 3 iij.

SIG.—One teaspoonful diluted in water, for a child three years old.

Where this disease is associated with carious teeth, or if the bone has become involved, the affected structures must be removed. Where extreme fetor of the breath occurs, the mouth should be washed out with weak solutions of permanganate of potash or a solution of the hypochlorites. In some cases alcoholic stimulants are indicated. Unquestionably, chlorate of potassium is the most successful remedy of all in this disease.

(4) STOMATITIS MYCOSA, OR PARASITIC STOMATITIS.

Synonyms.—THRUSH; SOOK; MUGUET; SPRUE; MILLET.

The disease consists of a yellowish-white growth of parasitic origin occurring on the mucous membrane of the mouth.

Causes.—The direct cause of mycotic stomatitis is the *Oidium albicans*. It is probable that this fungus is, in the majority of cases, carried into the mouth by the nipple or nursing-bottle. Either healthy or unhealthy children may have the disease, but those who have had some slight catarrhal inflammation of the mouth are especially predisposed to it. Thrush is especially found in poorly-nourished infants and those who are bottle-fed. Any cause producing mechanical injury to the mouth will predispose to the development of the thrush fungus. Like other forms of stomatitis, it may occur in children recovering from some long illness.

Symptoms.—Quite often there are no premonitory symptoms of thrush, the spots themselves being the first indication of the disease. These are of a grayish-white color, of variable size, and rest on the mucous membrane, occasionally, but not always, being elevated above the surface. They appear first on the internal surface of the cheeks and dorsum of the tongue, and then extend backward to the soft palate or forward to the lips. The patches have occasionally been found in the pharynx and esophagus. An examination of these patches by reflected light shows them to be developed within the epithelium, each being surrounded by a narrow ring of injected blood-vessels. As development progresses, the spot is pushed up above the level of the mucous membrane. Occasionally, the upper coat of a spot will drop off, leaving quite a deep ulcer. In bad cases a number of these ulcers will become confluent, their covering of fungus forming a sort of membrane. Microscopic examination of scrapings taken from

these spots will demonstrate the presence of *saccharomyces* or the *Oidium albicans*.

Treatment.—The prophylactic treatment of parasitic stomatitis consists in the careful attention to the mouth of the child, the avoidance of all forcible attempts at cleanliness and abrasions of the mucous membranes. The nursing-bottle and nipple must be kept antiseptically clean.

The curative treatment consists in the application to the mucous membrane of solutions of borax or bicarbonate of soda, either mixed with water or some syrup. A very good prescription is the following :

R. Acid. carbolic, gr. ij.
Sodii salicylat.,
Sodii biborat., aa gr. xxx.
Glycerin., ʒ ij.
Aque rosæ, q. s. ad . . . fʒj.

Sig.—For local application.

(5) GANGRENOUS STOMATITIS.

Synonyms.—*CANCERUM ORIS*; *NOMA*; *ORAL GANGRENE*; *WANGENBRAND*.

Gangrenous stomatitis consists in a rapidly developing inflammation of the cheek and adjacent tissues, accompanied by gangrene and destruction of the affected parts.

Causes.—This form of inflammation of the mouth is rarely seen in children under two years of age. From the second until the twelfth year is the period during which it is most likely to occur. Although the origin is somewhat obscure, it is possible that it may be microbic. From the manner in which it occurs, several cases in the same hospital being affected at one time, it would seem that there might be an infectious element in its causation. It is most common in debilitated children—those long suffering from improper food and bad hygienic surroundings or from the results of some infectious disease. It is said to be particularly common after measles and typhus fever, although it is not uncommon after any of the acute exanthemata. The excessive use of mercury is also an occasional cause.

Pathology.—*Cancerum oris* presents all the pathologic changes of acute phlegmonous gangrene in any other part of the body. We have here, as in other forms of gangrene, the three zones: In the center is the zone of blackened, destroyed tissue, around the outer margin

of which can be seen the second zone, consisting of connective-tissue cells in a state of active division. The blood-vessels will be found closed by thrombi consisting of various forms of microbic life. The third or outer zone consists of healthy tissue.

Symptoms.—During or following convalescence from one of the acute fevers, or in a debilitated child, a small nodule, somewhat hard



FIG. 17.—GANGRENOUS STOMATITIS.—(Dr. Stengel's case at the Children's Hospital.)

and sensitive, will appear on the gum or one of the cheeks. The skin or mucous membrane surrounding it will be either hard and swollen, or, as is not infrequently seen where the disease attacks the cheek first, there is simple swelling accompanied by considerable edema of the affected part. Although pain is usually complained of, there is occasionally very little discomfort connected with the progress

of this disease. The mucous membrane underlying the external swelling puffs up, forming a vesicle, which is filled by an ichorous fluid. This vesicle rapidly changes into a gangrenous ulcer of a blackish or reddish-brown hue. The lymphatics of the neck quickly become infiltrated on the same side as the affected cheek. The skin of the cheek changes to a bluish color over the point of primary induration. The ulcer rapidly deepens and spreads, first perforating the cheek, then continuing the destruction of tissue until the entire side of the face is destroyed. The disease may involve the whole of the cheek, the neck and even the eye on one side, but it very rarely becomes bilateral; the bones and teeth of the infected side are entirely laid bare. Gangrene of the mouth is accompanied by great constitutional depression. The temperature is variable; sometimes considerable fever is found, but as the disease progresses and septicemic symptoms arise, we usually find the fever assuming the character found in septicemia elsewhere.

Before death occurs the temperature is occasionally subnormal. The sequelæ of the disease are septic pneumonia, caused by the inspiration of infected material, and diarrheas, also of septic origin. Diphtheria has been observed in a number of cases.* As the blood-vessels of the affected part are usually filled with thrombi, perforation of these very rarely causes hemorrhage. Spontaneous recovery from this disease is extremely rare, the mortality being given as seventy to ninety per cent. of all cases affected.

Treatment.—The best treatment of gangrenous stomatitis lies in its prevention. With this object in view, a child sick with any of the infectious fevers should be placed in the best hygienic surroundings and its general health kept in as good order as possible by tonics and nourishing food. When the disease has once started, the system should be stimulated by concentrated nourishment, such as meat, milk, eggs, etc. Alcoholic stimulants are particularly indicated here, as in any form of septic infection. The gangrene should be kept from spreading by a thorough cauterization of the tissues immediately surrounding the ulcer. This can best be done by the use of the Paquelin cautery, the galvanocautery, caustic soda, or fuming nitric acid. In order

* In an epidemic of measles at St. Vincent's Home, under our observation at the present time, diphtheria complicates half the cases, and five deaths have occurred from cancrum oris. Two patients affected with the disease have recovered.

to lessen the horrible stench which arises from the gangrenous tissue. the mouth should be swabbed out thoroughly and the ulcer treated with permanganate of potash, carbolic acid, pure peroxide of hydrogen (the latter is very useful), or iodoform and bismuth.

(6) DIPHTHERIC STOMATITIS (CROUPOUS STOMATITIS).

This rare form of stomatitis may be of primary or secondary origin. When primary, the point of development of the membrane is usually on the lips, extending from thence to any part of the mouth. Secondly, it may spread from an infected tonsil to the lips, gums, or cheeks. A form of croupous stomatitis may arise from excessive use of irritating drugs used as mouth-washes. In the true form of diphtheric stomatitis the Klebs-Loeffler bacillus will be found.

Symptoms.—Where the disease is of true diphtheric origin, the symptoms will be those of ordinary diphtheria. Occasionally the symptoms are obscure and the ulcers may be well developed before they are discovered. The duration of the membrane is usually from three to six days, although it may last longer. Salivation usually forms an accompanying symptom, both it and the breath having a strongly fetid odor. As the membrane separates, there may be more or less hemorrhage, caused by the exposure of small blood-vessels which have been eaten into by the disease. This hemorrhage may be sometimes quite severe.

Treatment.—The treatment is the same as that of ordinary diphtheria. Where it is possible, the membrane should be carefully removed and the remaining ulcer washed thoroughly with corrosive sublimate, peroxid of hydrogen, or Loeffler's solution. In the croupous form, resulting from irritation, soothing antiseptic washes should be used. Treatment by the use of injections of antitoxin should always be resorted to, and the system supported by tonics and good food.

(7) SYPHILITIC STOMATITIS.

The primary infection of syphilis may occur in the mouth, the usual site of the chancre in this case being the lips. The origin of the infection is usually by transmission from a wet-nurse having the disease. The evidences of secondary syphilis of the mouth are not at all uncommon, and may be found on any part of the mucous membrane. The most common forms are those known as syphilitic fissures, or

rhagades. These usually occur at the angles of the mouth or upon the upper or lower lip; they may be single or multiple, and cause considerable pain. These fissures are very slow to heal spontaneously, and even after this has taken place they generally leave a disfiguring scar. Syphilitic papules are also found quite commonly, their seat being the commissure of the mouth and the free borders of the lips. If these split, they may resemble the former variety quite closely. In their elevation and position, and the moisture which covers their surface, they resemble condylomata lata. The ordinary mucous patch of syphilis may also be found, either on any part of the mucous membrane lining the mouth or on the tongue.

Treatment.—The treatment is that of syphilis generally. The affected parts should be treated by applications of corrosive sublimate, either in the strong solution applied with a brush, or in a weaker form to be used as a mouth-wash.

(8) MERCURIAL STOMATITIS (PTYALISM).

This consists in an inflammation of the mucous membrane of the mouth, attended by a great increase in the quantity of saliva and an alteration in the character of the secretion.

Causes.—The most common cause is the administration of too large a dose of mercury, a long-continued use of the drug, or an unnatural susceptibility of the patient.

Symptoms.—The first manifestation of ptyalism is an extreme tenderness of the gums, this being particularly felt in biting or in snapping the jaws together. The gums soon become red and swollen, the latter being greatest at the point of insertion of the teeth. There is usually a metallic taste in the mouth, although in children this will not often be complained of, because the patient is too young to associate cause with effect. The secretion of saliva becomes profuse, so that the patient is continually endeavoring to expectorate. The breath is fetid, the tongue swollen, and if the poisoning is severe, the latter may even protrude from the mouth. Ulcerative stomatitis may follow, and loosening and dropping out of the teeth sometimes occurs in severe cases. Complete necrosis of the maxillary bone occasionally follows.

Treatment.—The first indication of treatment is to stop the administration of mercurials. In order to increase elimination, small

doses of potassium iodid may be used, and this may further be aided by the use of saline laxatives. Frequent bathing and friction of the skin will help in this object. In order to check the hypersecretion of saliva, small doses of belladonna will be found useful. Where the pain and distress are great, opium may be used, although great care must be exercised in the administration of this drug, particularly to young children.

THE TONGUE.

Parenchymatous inflammation of the organ (glossitis) is quite rare in children, but the tongue and mouth often act as indicators for diseases in other parts of the body. Thus we have a blue tongue as a symptom of cyanosis; the pale or colorless tongue seen after severe hemorrhage or in conditions of anemia; the coated tongue found in all diseases of the digestive tract; the red and glazed tongue, with its border of coating seen in certain fevers. It should be remembered, however, that no special organisms have been found in the fur of the tongue and it would be futile to speak of any specific coatings for any one given disease.

DISEASES OF THE TONGUE.

The tongue may be congenitally above or below the normal size, the former condition being known as *macroglossia* and the latter as *microglossia*.

The first is usually found in two forms: (a) The fibrinous, in which the connective tissue of the organ is increased; (b) "A cavernous cystoid degeneration of the interstitial connective tissue, by which the resulting spaces come into connection with the lymph-vessels, constituting a condition closely resembling cavernous angioma, from which it receives its name of lymphangioma cavernosum." (Rotch.)

FIBRINOUS MACROGLOSSIA.

Symptoms.—The tongue is much enlarged, is of a bluish or violet color, and generally covered with a whitish or grayish coat. Indentations or ulceration of the organ, especially along the edges,

may occur from pressure of the teeth. From the size of the tongue, respiration and deglutition may be interfered with. The lips, and especially the lower one, become thick, edematous, or ulcerated, and salivation is always present. Macroglossia is most frequently found in deformed subjects or cretins.

Treatment.—The treatment is usually palliative. The tongue should be kept clean with warm, slightly alkaline solutions, or where the organ threatens by its size the stoppage of respiration or deglutition, part of it should be removed.



FIG. 18.—MACROGLOSSIA.—(Dr. W. W. Keen's case.)

A rare condition known as *lingua geographica*, or "mappy tongue," has been described. The symptoms are the appearance of one or more small patches on the dorsum of the tongue, these patches frequently spreading, uniting so that the entire surface of the organ may be covered. The patches are red in color, smooth, and the filiform papillæ are absent. The unaffected portions of the tongue are normal, except that the papillæ on the borders of the denuded portions are white and prominent. (Rotch.) The condition has no special significance and needs no treatment.

GLOSSITIS.

Definition.—An acute inflammation of the parenchyma of the tongue.

Symptoms.—Pain and swelling of the organ, accompanied by a rise of temperature and a hypersecretion of saliva. Occasionally enlargement of the tongue may interfere with respiration.

Causes.—The disease usually arises from direct injury to the tongue, as in the swallowing of irritating substances. The inflammation may occasionally be septic in origin.

The treatment is purely symptomatic, depending upon the cause.

RANULA.

Ranula is a cystic tumor of varying size which is found on one or the other side of the frenum of the tongue. The tumor is semi-translucent, soft, and over it are seen dilated veins. Its contents consist of a clear, glairy fluid of mucoid character. Its cause is in some cases rather obscure. It is probable that it is due to dilatation of the ducts of the salivary glands or an obstruction of the ducts of the sublingual mucous glands. These tumors generally give little or no pain. They are rather rare in childhood.

Treatment.—The contents of the cyst should be emptied, and as recurrence is one of the characteristics of this form of tumor, it is necessary to destroy the lining membrane by the use of caustic. It has been recommended that fifteen minims of a mixture of tincture of iodine and water each ten parts, with iodide of potassium one part, will prevent the cyst from filling again. It is probable, however, that a more satisfactory result can be obtained by the application of nitrate of silver to the sac after its contents have been removed.

DENTITION, NORMAL AND DELAYED.

Physiology of the Development of the Teeth.—At about the seventh week of intra-uterine life the stratified epithelium of the mucous membrane of the two maxillæ becomes thickened, forming a

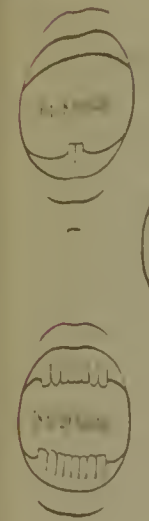
ridge. This process passes downward into a recess of the developing embryonic jaw; this process is known as the enamel groove. The downward growth, or invagination, of the epithelium forms what is known as the enamel germ, its position being indicated by a slight groove in the mucous membrane of the jaw. Next we find the enamel groove and enamel germ elongating downward, the deeper part declining outward, forming an angle to the upper portion or neck. After this there is an increased development at certain points corresponding to the situation of the future milk teeth. The common enamel germ now becomes divided at its deeper portion into a number of divisions, each forming what may be called a special enamel germ, which corresponds to what will later be the milk teeth, or, more properly, each enamel germ will later form an individual tooth contained in its own dental sac. About this time there grows up from the underlying tissue into each enamel germ a distinct vascular papilla, known as the dental papilla, and upon it the enamel germ adheres. This enamel germ consists of three layers, or, as it is sometimes described, as two layers of epithelium separated by an interval. While part of the sub-epithelial tissue is elevated to form the dental papillæ, the part which bounds the embryonic teeth forms the dental sacs, and the embryonic jaw, which at first is merely a groove of bone in which the dental germs lie, now sends up processes, forming divisions or partitions separating the teeth from one another. The papilla is composed of nucleated cells arranged in a meshwork, the outer or peripheral part of which is covered with a layer of special columnar nucleated cells called odontoblasts; these latter form the dentine, while the remainder of the papilla forms the tooth pulp. As the dentine increases in thickness, the papillæ diminish in size, and when the tooth is cut only a small amount remains as the dental pulp, and in this run the blood-vessels and branches of the inferior dental nerve which enter the tooth at the inferior extremity of each fang. The enamel consists of three parts—an inner membrane composed of a layer of columnar epithelium in contact with the dentine, called enamel cells; external to this we find one or more layers of small polyhedral nucleated cells; an outer membrane consisting of several layers of epithelium; lastly, a middle membrane formed of a matrix of non-vascular, gelatinous tissue containing a hyaline interstitial substance. The enamel is formed by the enamel cells of the outer membrane. The development of the teeth progresses

steadily from birth during the whole period of infant life. As each tooth contained in its dental sac and set in its small cavity of bone develops, elongation takes place, beginning at the fang. The tooth in its growth follows the path of least resistance, which is always toward the mucous membrane, which at the period of birth covers it. Finally, from pressure against the mucous membrane, atrophy or absorption of the latter takes place and the tooth appears above the level of the mucous membrane.

As the child advances in years, the temporary or milk teeth are gradually replaced by the permanent teeth, which push their way up from beneath the former, absorbing in their growth the whole of the fang of each of the first set, until little is left except the crown, which finally comes away.

The age at which the first tooth appears varies considerably, this difference depending upon many causes. As a general rule, in healthy children the first tooth appears at from about the sixth to the eighth month. The eruption of the teeth begins later in children affected by rachitis, syphilis, or tuberculosis, or those who may be classified under a general head as being "feeble children." The lower central incisor usually appears first, and from this time dentition may be divided into five periods, between each of which is an interval of varying length, sometimes known as interdental intervals. The *first period* occupies the time when the two lower incisors are cut. In the *second period* the four upper incisors make their appearance, these being followed very often by an interval of several weeks. The *third period* is that in which the lower lateral incisors and the anterior molars of the upper and lower jaw are cut; this lasts from the twelfth to the fourteenth month, and is usually followed by quite a long interval of rest. The *fourth period* begins about the eighteenth or twentieth month, and it is about this time that the canines appear. The *fifth period* occurs at two and a half years of age, when the posterior molars are cut. The entire "milk" set is composed of twenty teeth, ten in each jaw, arranged as follows:

DENTAL PERIODS.	AGE.	GROUP OF TEETH.
I,	6 to 8 months,	two middle lower incisors.
II,	8 to 10 "	four upper incisors.
III,	12 to 14 "	two lower lateral incisors and four first molars.
IV,	18 to 20 "	four canines.
V,	28 to 32 "	four second molars.



At birth the jaw contains the entire milk set, the crowns of which are calcified. Besides these there is one member of the second set—the six-year-old molar—the calcification of which begins during uterine life at about the sixth month. The permanent incisors begin to calcify during the first month of life; the canines in the first or second year. Calcification of the crown of the second molar is completed about the fourth year, and of the third permanent molar, or wisdom tooth, at seventeen to twenty-five years. Thirty-two teeth in

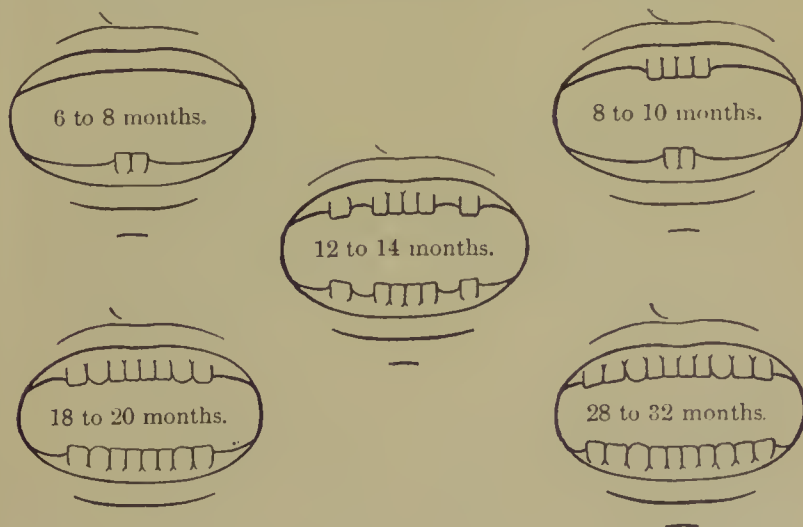


FIG. 19.

all comprise the second or permanent set, and during their development the jaws increase in length to provide for the greater number of teeth. The second dentition can not be divided into as clearly marked periods as the first, but the ages at which the teeth make their appearance are, generally speaking, as follows; it must be remembered, however, that many causes which delay the eruption of the first teeth will also retard the second set:

YEARS.	GROUPS.
Six,	Four first molars.
Seven,	Four middle incisors.
Eight,	Four lateral incisors.
Nine,	Four first bicuspid.
Ten,	Four second bicuspid.
Eleven,	Four canines.
Twelve,	Four second molars.
Seventeen to twenty-five,	Four third molars (wisdom teeth).

Dentition being a physiologic process, there should be no symptoms of a pathologic nature which can be attributed to it. It is

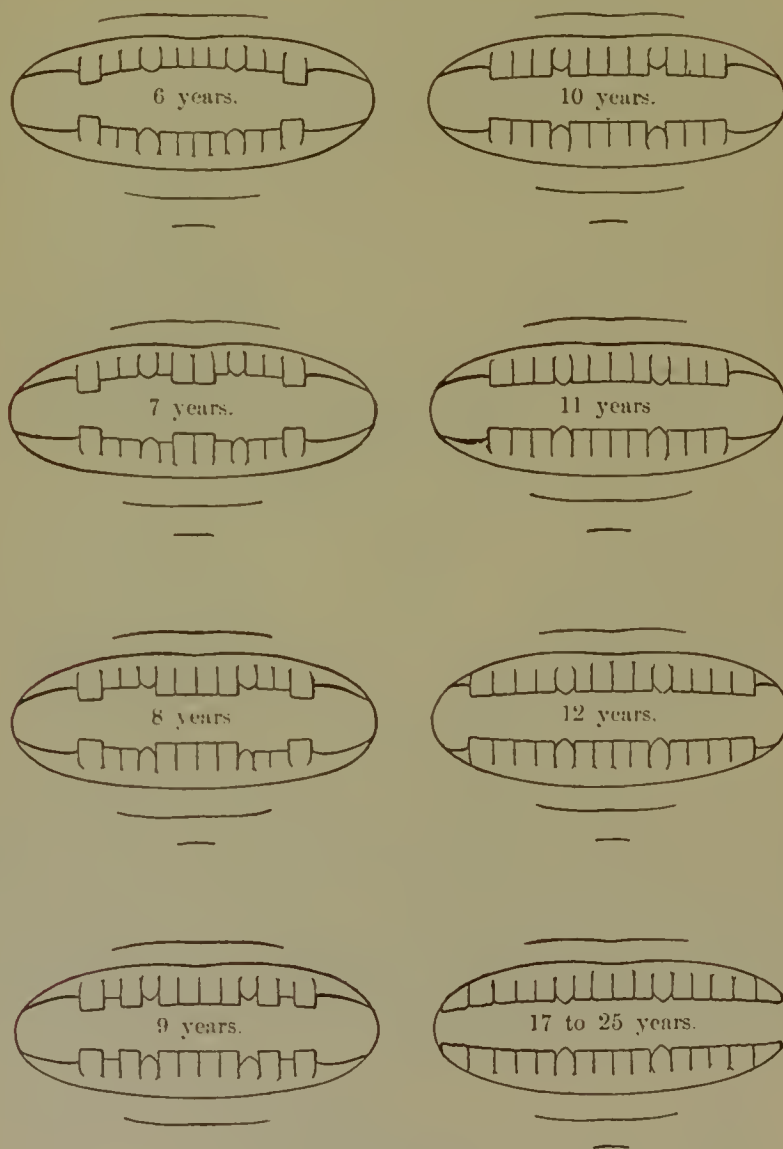


FIG. 20.—(From Rotch.)

true that various disorders, principally referable to the nervous system, the respiration, the skin, the digestive system, and organs of special

sense, have been associated with it, particularly by the older writers; but if the child at final dentition is in a thoroughly healthy condition, there should be no bad symptoms other than some irritability of temper and possibly a slight disturbance of the alimentary tract. Even the latter is by no means a necessary consequence. It can not be denied that the gastro-intestinal tract is more predisposed to fermentative diarrheas during dentition; however, these are not caused by teething primarily, but by infection from without, the intestinal tract only being in a more irritable condition, and therefore less resistant to external sources of infection.

One of the complications of dentition most dreaded by mothers are convulsions. Leaving out of the question those children with neurotic histories, or those whose constitutions have been weakened by inherited syphilis, rachitis, or tuberculosis, we can not now recall a single case in which teething has primarily caused convulsions. In the majority of patients who have come under our notice with convulsions during dentition, the cause could almost invariably be traced to an attack of acute indigestion in a child whose digestive apparatus was in a hypersensitive state at this particular time; the primary cause, however, has been a badly-regulated diet, and not the cutting of the tooth. Bronchitis and bronchopneumonia have also been ascribed to dentition. It is true that a slight irritation of the faucial or nasal mucous membrane may, in a sensitive child, be produced by sympathetic irritation; but here again we must say that we have never seen a case of either of the before-mentioned diseases arise from dentition. A slight erythematous rash, formerly known as tooth-rash and still associated with dentition, in the minds of parents, sometimes covers the body at various intervals during this period, but as children affected by it have always at the same time had gastro-intestinal disorders, we can not believe that dentition was responsible for the cutaneous affection. In children affected by struma or in rachitic babies, it is not uncommon to find enlargement of the glands of the neck or some irritation of the ears.

Ordinarily a healthy child will evince no symptoms severe enough to demand any special treatment. Where, however, an infant is feverish, restless, and irritable, it is proper that the physician endeavor to quiet this condition by suitable medicinal means. Small repeated doses of bromids with camphor water, or, what we have found more

useful, small doses of antipyrin, will generally bring about this result. A prescription which we have frequently employed is as follows :

R. Sodium bromid, grs. ij
 Antipyrin, grs. i-ij
 Glycerin, ℥ij
 Spts. peppermint, gtt. ½-j
 Camphor water (or soda mint mixture), ʒj.

SIG.—To be repeated every two or three hours until the child is quieted.

During the period of dentition the child's diet should receive the strictest care, as it is at this time that the most virulent forms of intestinal diseases frequently make their appearance. The "second summer," which is looked upon with so much dread by mothers, is frequently coincident with the period of active dentition, and it must be borne in mind that at this time the nervous system is generally in a more or less hypersensitive condition, and therefore the digestive system, sharing in this irritability, is less able to combat the attacks made on it by external causes of infection. Children whose systems are below par from constitutional disease should be appropriately treated, and rachitic or strumous patients, who are apt to be especially depressed at this time, and are always slow in cutting their teeth, should be treated by the administration of oils and such remedies as phosphorus and the salts of calcium and general tonics. Where a tooth is slow in coming through the gum and its eruption is accompanied by a decided and continued rise of temperature or severe nervous symptoms, lancing the gum is often beneficial. Unless the physician has a clear idea of the exact position of the tooth which is causing the trouble, gum-lancing is of very little use and simply produces an open wound which always offers an entrance point for infective germs. The custom of indiscriminate gum-lancing is to be condemned.

DISEASES OF THE ESOPHAGUS.

ESOPHAGITIS.

Inflammations of the esophagus are of rare occurrence in children. It is stated that inflammations of the mouth, although very common, extend into the esophagus but rarely.

ACUTE ESOPHAGITIS.

Inflammation of the esophagus may be caused by lacerations produced by swallowing a foreign body or by corrosive poisons. Either of these causes may involve the mucous membrane or may extend into the muscular coat. The latter is, however, of rare occurrence. Where a foreign body has been swallowed, the early symptoms are pain or swelling and a general discomfort in the region. Where strong acids or caustic alkalies have been taken into the mouth, the mucous membrane of the latter will be inflamed and ulcerated, the character of both varying somewhat with the poison taken. There will be a burning pain in all the parts affected, great thirst, and a spasm of the esophagus following attempts at swallowing. Deglutition is almost impossible. The period of acute inflammation will last several days, and during this time there is often great danger of suffocation from edema of the glottis. Later, symptoms of stricture are very common, these usually occurring in from three to six months after the injury.

Treatment.—The indications for treatment are to remove the foreign body, and where the inflammation is produced by poisons, to neutralize the latter as quickly as possible by the use of oils, demulcent drinks, and ice. For the pain opium is indicated. The treatment of stricture of the esophagus is surgical.

RETROPHARYNGEAL ABSCESS (RETROPHARYNGEAL LYMPHADENITIS).

The lymphatic glands imbedded in the posterior wall of the pharynx occasionally suppurate, forming an abscess most dangerous to life because of mechanical obstruction to the trachea produced by pressure or edema, or by suffocation from a spontaneous opening deluging with pus the air-passages. It is of much importance to promptly recognize the condition, both to institute treatment, if time permits, or to meet the exigencies thus induced, and, above all, to differentiate this from simple tonsillitis, laryngeal stenosis, or impaction of a foreign body. Two varieties exist, one, the commoner, occurring in infants usually under one year or two, seldom above three; the other, rarer, resulting from caries of the cervical vertebræ, is seen only in older children.

The retropharyngeal lymph nodes are described (Simon) as forming

a chain on either side of the median line between the pharyngeal and prevertebral muscles; these undergo atrophy after the third year. The adenitis may be severe enough to produce serious local symptoms, yet stop short of suppuration; it is also occasionally associated with external cervico-adenitis.

Causes.—Children are very prone to lymphatic inflammations, especially of the cervical glands. The causes of retropharyngeal abscess are usually specific infections, most often tubercular or influenzal or less frequently following scarlatina, measles, or diphtheria. The immediate cause is usually an inflammatory condition of the nasal or pharyngeal mucous membrane. Abscess sometimes occurs in children hitherto vigorous, but more readily in the weaker ones subject to catarrhal affections.

Symptoms.—Abscess of the retropharynx may begin slowly or arise with alarming suddenness; indeed, sometimes death is imminent or occurs before the trouble is, or can be, suspected. The situation is in sight on the vault of the pharynx, or low down, where it can only be felt by the finger. The swelling may be seen nearly in the median wall of the pharynx or oftener to one side. There may have been an antecedent catarrh. There may be high temperature, loss of flesh and other evidences of an acute suppurative process—a prostration out of all proportion to the other phenomena. The first definite symptom is usually an attack of dyspnea or asphyxia due to pressure of the abscess on the larynx, labored mouth-breathing during sleep, the head is thrown back, and there is difficulty in swallowing. The voice becomes nasal, food is regurgitated through the nose or mouth, and a squeaking cry occurs like the “quacking” of a duck. The tumor sometimes shows externally. The finger in the throat will tell most by demonstrating the position, size, and consistency of the mass.

Prognosis.—Death may result by suffocation, asphyxia, or drowning by pus where the disease is not recognized early enough, and rarely may come from burrowing, ulceration of the carotid, etc. If the prostration is profound, this may cause death after the pus is evacuated. The mortality is five per cent.

Diagnosis.—Instances of trouble in swallowing occurring among infants with mouth-breathing or dyspnea call for examination of the throat by touch as well as inspection. Not many mistakes will then be made. Few accomplishments in examining children are more im-

portant than to acquire skill in touching the throat with an exploring finger for this or other morbid conditions.

Treatment.—If the condition is recognized early enough, relief can be obtained by hot applications, chiefly to assist the abscess in pointing; resolution can scarcely be hoped for. Where pus is evident, the cavity should be opened at once, using great care to prevent the pus flowing into the trachea, which is best accomplished by keeping the head well forward or it may be thrown forward the instant pus is set free. It is well not to use a gag; as Holt points out, this alone may cause serious asphyxia. He also recommends that the instrument to make the opening should be the human finger nail in preference to a knife. We have used this on two occasions and seen it done in others with good effect. A knife is sometimes required, when the mouth should be opened and held in position with a small, narrow tongue depressor (our device of a wire loop serves us best) and the incisions made with a short-bladed tenotome, from the side toward the median line. We can not see the force of the claims of certain surgeons who insist on the advantages of external incision, except it may be for the cases due to Pott's disease. If the abscess be large and the tissue at the side of the pharynx be involved, and especially if there be burrowing of pus into the deeper tissue, then, in order to insure proper drainage, an incision should be made in the neck and the wound and abscess cavity packed with gauze.

RETROPHARYNGEAL ABSCESS FROM CARIES OF THE CERVICAL VERTEBRA.

This variety is rare and seldom occurs in children under three years of age. The pus cavity is larger, it forms slowly, often for months, and is accompanied by more marked constitutional depression but less sudden changes; the swelling is more often in the median line, and not so circumscribed. The symptoms of cervical Pott's disease usually precede, though the abscess may occur before the deformity, and external swelling is more common; on digital exploration an angular prominence may be felt on the posterior wall of the pharynx. This form of abscess may open spontaneously on the outer surface below the jaw, or lower in the neck, or the pus burrows in front of the spine; the cavity once open by punctures or spontane-

ously may refill and become a slow-discharging sinus. The treatment is incision, preferably external, and drainage. We saw a case of a boy of eight in a hospital become asphyxiated during dinner, and on thrusting the finger in the throat to extract a piece of suspected food, buried our finger in a large cavity, and a fragment of meat was withdrawn, along with several ounces of pus. Once opened, the cavity heals, as a rule, but it sometimes requires cleaning out and scraping.

DISEASES OF THE STOMACH.

GASTRITIS.

Synonyms.—ACUTE GASTRIC CATARRH; ACUTE DYSPEPSIA; GASTRIC FEVER; GASTROADENITIS.

Varieties.—Acute gastritis; chronic gastritis; ulcerative gastritis; gastromalacia.

Acute gastritis is an acute inflammation of the glandular tissue of the stomach interfering with the digestive functions, and generally due to the presence of irritating ingesta (Blackader).

Causes.—By far the most frequent cause is food improper in kind, quantity, preparation, or time of use. Although acute gastritis rarely occurs in children fed on breast milk, yet it is occasionally seen. In most cases the attack can be traced to some morsel of coarse "table food," candy, or cakes. The substitution of artificial feeding in nurslings, especially where the food is improperly prepared, is another frequent and powerful cause. Unsterilized water often produces acute dyspepsia. An attack of acute gastritis sometimes precedes the eruption of a tooth, although in many instances it is hard to prove whether the attack is due primarily to disordered dentition or to some error in diet during this epoch when the whole digestive tract is in a more or less irritable state.

In older children, large quantities of food taken at one time, late meals, highly-spiced articles, too great a variety of food, and very rapid eating are the most common causes. Children born with an enfeebled nervous system and those brought up on proprietary foods are

particularly liable to gastritis. Sudden chilling of the skin has been shown to be an occasional cause.

Symptoms.—At the onset of an attack of gastritis a child who previously has been reasonably healthy loses interest in its play and surroundings. If asleep, it may awake crying and complaining of pain, usually referred to the abdomen. In young children the thighs are then flexed on the abdomen and the legs on the thighs; the arms also are flexed. The crying is sharp, shrill, and continuous, and around the mouth and chin there is generally a pale blue line. In the febrile type the temperature may rise to 102° or 103° F. The pulse and respiration are both accelerated. Vomiting is an almost constant symptom, accompanied by nausea and full unloading or retching; this vomiting must never be mistaken for the simple regurgitation of milk which occurs when the infant has taken more than the stomach can hold. Upon examination of the vomited matter hydrochloric acid will be found to be deficient. The emesis may continue for a considerable time after the contents of the stomach have been evacuated. The tongue is usually covered with a white or brownish-white coat; this coating is particularly heavy at the base of the tongue, while the tip and edges of the latter are a bright red. There is complete loss of appetite, and where the intestines become involved (as they nearly always are to some extent) there will be diarrhea, with the expulsion first of the normal contents of the bowels, and later large quantities of mucus. Occasionally the attack is ushered in by convulsions, which are sometimes quite severe, and one of us remembers a child five years of age who, forty-eight hours after having eaten a large variety of cakes and candy, was taken with violent convulsions, the character of which was almost identical with eclampsia in a pregnant woman. Unconsciousness was to all appearances profound; the temperature and pulse were both considerably above normal, and the type of spasm was first tonic, followed by a long-continued series of clonic movements. The symptoms rapidly disappeared after thorough evacuation of the stomach and bowels, wrapping the child in a hot wet pack, and stimulation of the rapidly-failing heart by hypodermic injections of strychnin and atropin.

Other symptoms of acute gastritis which are noticed particularly in older children are: tenderness in the epigastrium, with a moderate distention of the abdomen, often causing pain or uneasiness on the slightest

touch; headache, which may be general or confined to the frontal or occipital regions; occasionally pharyngitis may appear. Phenomena simulating profound nervous disturbance may be occasionally met; thus, Seibert has reported a number of cases in which the symptoms of gastritis closely resembled those of cerebral meningitis, and instances where aphasia and hemiplegia followed the eating of a large amount of indigestible food are reported by Henoeh, Fraenkel, and others. Where the inflammation extends as far as the duodenum, an attack of catarrhal jaundice may follow within a day or two. If the attack is not very severe, the symptoms will rapidly subside in from one to three days. When severe, or the cause is not quickly removed, the stomach may remain inflamed for several days, the gastric irritation being accompanied by fever and evidences of rather severe exhaustion.

Pathology.—The mucous membrane of the stomach appears swollen and reddened. In severe attacks erosions and even slight hemorrhages may be found. The tissue beneath the mucous membrane—the submucosa—will be found edematous; when seen through a microscope, the interstitial tissue is infiltrated with leukocytes, and the differentiation between the parietal and principal cells can not be made out. All the cells appear cloudy and granular and partially separated from the membrana propria of the gland. There is a great abundance of the mucous cells in the pyloric region, and this increase extends deeply into the ducts of the gland.

Prognosis.—The prognosis of acute gastritis is good, except where the child has for a long time been badly nourished. It is less favorable in bottle-fed babies and in older children where the attack is complicated by severe convulsions. If nephritis is coexistent, or where the attack occurs at the end of one of the continued fevers, the outlook is not so good.

Treatment.—In an attack of acute indigestion the first indication is to remove the irritating material as quickly as possible. With this object in view, the vomiting should not be checked unless it produces severe exhaustion. Indeed, very frequently it is well to aid the expulsion of undigested food by the administration of emetics, such as weak mustard water or ipecac. Ipecac is best given in the form of syrup or wine, in teaspoonful doses, repeated until vomiting occurs. The bowels should be evacuated thoroughly by means of some mild purgative, and probably for this purpose there is no drug so useful as

calomel. It has been our experience that this agent can be given with much better effect in small doses and repeated at short intervals until the desired action is obtained. A useful formula is the following:

R. Hydrarg. chloridi mitis, grs. iij
 Ipecac. pulv., grs. vj
 Sodii bicarb., ʒ ij.

M. et div. chart No. xxx.

SIG.—One powder every hour until the stools change to normal color.

It is often good practice, after having used these powders for twelve hours, to administer a dram or two of castor oil. Young children often take this agent remarkably well; where, however, the child objects to taking it, the oil may be sandwiched between two thin layers of some tart jelly, or it may be given with a few drops of whisky, or floating on ice-water. In older children, any of the formulæ given below may be found useful:

R. Hydrarg. chloridi mitis, grs. ij-v
 Sodii bicarb., grs. xij-xxx.

M. et div. chart No. viii.

SIG.—One powder every two hours until the bowels are freely evacuated. For a child from two to four years.

R. Sodii et potassii tartratis, grs. xx-xl
 Sodii bicarb., grs. iij-vj.

M. et div. chart No. vi.

SIG.—One powder to be given in a wineglass of hot water every hour or two until the bowels are fully evacuated.

R. Hydrarg. cum creta, grs. vj-vij
 Sodii bicarb., grs. viij-x
 Pulv. rhei, grs. xij.

M. et div. chart No. iv.

SIG.—One to be given every two hours until the bowels are emptied.

The intestinal antiseptics, such as salol, beta-naphtol, and naphthalene, given in doses suitable for the age of the child, are very useful. Beta-naphtol-bismuth, in doses of from one to five grs., according to the age of the child, and repeated every three or four hours, has given good results. Where the vomiting is persistent, minute doses of calomel mixed with bicarbonate of soda, or triturated with sugar of milk, are very beneficial. Small doses of $\frac{1}{10}$ of a gr. of calomel combined with from $\frac{1}{200}$ to $\frac{1}{500}$ of a gr. of arsenite of copper have,

in our experience, worked admirably in checking several cases of severe vomiting. Where the vomiting continues for some time after the stomach is empty or immediately follows the taking of food, from one to five drops of tincture of *nux vomica*, given just before feeding, will often stop further trouble. Small doses of sulphate of magnesium have been recommended by Stuart Patterson in the treatment of this condition. Where the attack involves the intestines, the accompanying diarrhea is best treated by rectal injections of a pint or a pint and a half of cool, sterilized water containing one of the intestinal antiseptics. A useful formula is the following:

R. Bismuth subnitrat.,
Salol,
Sodii bicarb. aa grs. v.

M.

SIG.—The entire powder to be used at an injection. These should be repeated from one to three times a day, according to the severity of the case.

Injections into the bowel of a sterilized one per cent. solution of chlorid of sodium are particularly useful, and can be relied on for most cases. Of the greatest importance in acute gastritis is the regulation of the diet: during the attack the stomach should be allowed absolute rest, no food being given. In bottle-fed babies, particularly during the summer months, milk and all articles containing milk should be omitted. For the first twenty-four to thirty-six hours the infant should receive nothing but cold, sterilized water in quantities of half an ounce to an ounce every three or four hours, and slowly administered. This water may contain about twenty or thirty drops of good whisky or brandy. When the vomiting and diarrhea have ceased, the child may receive small quantities of some good beef extract or thin, strained broth. Barley water or rice water may also be allowed in small portions. Where meat extracts can not be borne by the stomach, albumin water, made by mixing the white of one fresh egg in a glass of water and having in it a little salt, will sometimes do very well, and occasionally koumiss is well retained by older children. For the latter the diet should consist of thin broths, and where the intestines are not involved, small quantities of starchy foods may be allowed. Where fever is present, the child should be occasionally sponged with cool water containing alcohol or ammonia.

The customary diet of the child should be resumed by degrees. Many children recover much faster if they are sent to the country, or particularly the seashore. Frequently even the change of a visit to the house of some relative near by will prove beneficial.

CHRONIC GASTRITIS.

Synonyms.—CHRONIC GLANDULAR GASTRITIS; CHRONIC VOMITING.

This disease consists in a chronic inflammation of the mucous membrane lining the stomach, attended by hyperemia and thickening of the mucosa, giving rise to a decrease both in the quantity and quality of the true glandular secretion of the stomach—the gastric juice. As a result of the chronic catarrh, large quantities of adherent mucus of a strongly alkaline reaction are formed. This results in an enfeeblement of the digestive powers of the stomach, which, in turn, frequently causes retention of food and consequent fermentation.

Varieties.—Chronic infantile gastric catarrh; chronic gastro-enteritis.

Causes.—A very common cause is the continuation of an attack of acute gastric catarrh, the treatment of which has been neglected. The too hasty mastication of food, eating at too frequent intervals, a diet unsuitable for the child, such as very rich, improperly cooked, or highly seasoned foods; the continued use of candy, cakes, fried foods, or hot breads; general bad hygiene, uncleanness, and the constant use of starchy foods, or those containing too large an amount of sugar, are frequent causes of chronic gastritis in infants. As predisposing causes we have syphilis, rachitis, scrofula, and a low degree of inherent vitality. Diseases of the heart, lungs, liver, and kidneys may also act as predisposing causes.

The repeated swallowing of infected discharges from ulcerations in the mouth, throat, or nose, or the mucus from chronic naso-pharyngeal catarrh, and carious teeth may also act as causes.

Pathology.—The pathologic changes in chronic gastritis are of the same nature as those in the acute form. The mucous membrane, as the disease progresses, becomes thicker, its color turns grayish, with deeply-injected areas. The whole membrane is covered with patches of dense, sticky mucus. Throughout the whole mucosa, but particularly in the region of the pylorus, we find small papillary

projections, caused by the hypertrophy of the mucous membrane. This condition is sometimes known as *état mamellonné*, and may, in very bad cases, advance to such an extent as to produce absolute polypoid growth. The gland cells may be destroyed in patches, rendering the differentiation between the principal and parietal cells impossible. If the disease progresses, an infiltration of small cells takes place, with loosening and separation of the superficial layer of the epithelium. According to Ewald, there is a mucoid transformation of the cells of the tubules, which may extend to the base of the gland. In very advanced cases there is a progressive fatty degeneration of the cells, finally ending in an acute atrophy of the mucous membrane.

Symptoms.—The attack is usually a simple continuation of the symptoms of acute gastritis. The vomiting first is of the contents of the stomach, then of sour, bile-stained mucus, and, finally, when this symptom continues, there will be simply an ejection of clear, watery fluid, sour-smelling and tasting, frequently mixed with fragments of food. Vomiting is increased after the taking of food, and in young infants particularly after the ingestion of farinaceous foods. Vague feelings of distress and pain are felt, referred to the abdomen, the infant generally lying with its legs drawn up. The abdomen itself is usually distended and distinctly tender to the touch. As a general rule, the bowels are constipated, although there may be occasional short attacks of diarrhea, during which considerable quantities of mucus are passed. Eructations of gas are common, particularly after feeding. The tongue is coated, this coating being greatest at the back and center of the organ. The papillæ are enlarged and the edges and tip are of a bright glazed red.

The skin in children suffering from chronic gastritis is dry and scurfy; this symptom is particularly noticeable in the surface of the scalp. Various irregular forms of skin eruptions may appear. Several of the forms of stomatitis are not rare, the parasitic variety being that most commonly met with. The general condition of these patients is poor, and their appearance is that of chronic ill health. They are thin, pale, with sunken eyes, depressed fontanel, and, where the disease is prolonged, show the characteristic angular face of marasmus. Under the eyes and around the mouth will be seen the blue line so common in chronic intestinal affections. The appe-

Diagnosis.—The

Prognosis.—

tite is generally poor, although it is not at all uncommon for a child who has refused food when offered at the proper times to ask eagerly for all sorts of odd articles of diet between meals and at night. These children sleep poorly; at night they are often disturbed by frightful dreams, from which they start wildly and cry out; incontinence of urine is very common. Frontal headache is a frequent symptom, and choreic movements not seldom occur. Cases of apparent loss of consciousness and symptoms resembling *petit mal* due to chronic gastritis have been reported. Attacks of irregular heart action are very frequently met with, but this symptom appears mostly in older children. These children seem to be continually deficient in bodily heat, have cold feet and hands, which, unless they are continually surrounded by external warmth, feel to them icy cold. From various reflex irritations we may have a dry, hacking, or, as is occasionally heard, a loud, ringing cough, somewhat paroxysmal in character and increased at night or after taking some article of indigestible food. Various intestinal irritations simulating worms may also be present. Occasionally a slight rise of temperature is noticed in the afternoons.

Diagnosis.—The diagnosis is founded on the long continuance of the disease, the chronically disturbed digestion, bad nutrition, and the exclusion of organic diseases of the heart, lungs, and kidney. The disease with which it is most likely to be confounded is tuberculosis, especially when the latter has reached an advanced stage; but in tuberculosis we have involvement of the lungs, and a greater and more constant rise of temperature. The abdomen, too, of a tuberculous patient is apt to be sunken; the finding of the bacillus tuberculosis in any of the discharges would settle the diagnosis.

From syphilis it can be differentiated by the fact that in specific disease we have the characteristic eruptions and many other symptoms of this affection. In any doubtful case, the application of antisyphilitic remedies may settle the question of the diagnosis. Typhoid fever can be differentiated by the character of the stools in the latter disease, the fact that young infants are not very susceptible to typhoid fever, the characteristic temperature range, and the greater severity of the attack. Widal's blood test will conclusively prove the diagnosis of typhoid fever.

Prognosis.—Under proper diet, care, and hygienic surroundings,

the outlook for children affected with chronic gastritis is fairly good. The prognosis is rather worse during the teething period, particularly if this occurs during the summer months. It should not be forgotten that while chronic inflammation of the stomach is not often fatal itself, yet it so lowers the vitality of the child as to render it an easy prey to other diseases.

Treatment.—The first indication of treatment is to carefully regulate the diet, feeding the child at as regular intervals as possible, and far enough apart to give the stomach a period of absolute rest between them. Of scarcely less importance is the general hygienic surroundings of the child, its bath, clothing, and general mode of life. In selecting a diet for these cases, we must pick out one which will adapt itself to the portion of the digestive tract which is the healthiest. Infants who have been fed on farinaceous foods or condensed milk, those who have nursed from the breast of an unhealthy mother, or have been given the breast at irregular intervals, so that their stomachs are kept in a continually overloaded condition, should have their diet strictly regulated. Infants who have been fed on artificial foods should be placed on a diet of modified milk, the formula of which may have to be changed many times; or, if that disagrees, they should be fed on small and carefully regulated quantities of animal broths or extracts, or predigested milk. Breast-fed babies should be nursed at exact intervals of two and one-half to three hours and between these periods no food whatever should be given. In older children, a carefully prepared bill of fare should be directed by the physician each day. This diet list (best written down) should carefully avoid all rich or highly-seasoned foods, and a great variety, although a certain amount of change in diet is as important to a child as it is to an adult. The particular kind of food must be selected by the physician for each individual case, for it is impossible to give definite rules as to the diet proper for these children. It is of importance, however, that the heaviest meal should be given in the middle of the day, and that a very light supper, consisting of crackers and warm milk, or a little thin strained broth, should be eaten at night. The last meal should be taken not less than an hour before retiring. For more careful directions as to the feeding of these children the reader is referred to the chapter on the preparation of foods. These patients should be kept as much as possible in the open air; although they do well in the country, yet

the seashore is decidedly the best place for them. It is of considerable importance, in selecting a place for their convalescence, that one be chosen where the drainage is at least fairly good. On account of the hyperesthetic nervous condition which almost always accompanies chronic digestive diseases of all kinds, these patients should be kept as far as possible from frights and nervous shocks. They should not be put to school too early, or subjected to the long-continued hours of study which children usually have to undergo. The daily bath is a matter of considerable importance. Each night and morning the patient should be sponged off with water at a temperature of about 86° F. (30° C.). Sponge baths of sea water or water containing rock salt are of great value. Wiederhofer recommends that as soon as a child is out of bed in the morning it should receive a good rubbing with a rough towel. It should then stand in the bath, which contains warm water three or four inches in depth, and be sponged down as quickly as possible with cool salt water, and a half a gallon of the same be emptied over the chest and shoulders. The child should again be rubbed dry until the skin is well reddened. Long hours of sleep are of the utmost importance to these patients. Massage of the abdomen or the application of faradic electricity are extremely useful adjuncts in the treatment.

The indications for medicinal treatment are, first, to rid, as far as possible, the mucous membrane of the adherent mucus which covers it, and then to stimulate it to a secretion of healthy gastric juice. In order to accomplish the former the practice of washing out the stomach by means of a stomach-tube and funnel is of the greatest use and should be repeated three or four times a week. Where this can not be borne, as in cases where it excites persistent vomiting, or where organic, cardiac, or pulmonary disease exists, lavage may be substituted by warm alkaline drinks or small quantities of alkaline mineral water. Calomel in these cases is a remedy of great usefulness; small doses may be given in combination with bicarbonate of soda. Potassio-tartrate of soda, or phosphate of soda, given three or four times a day, has peculiar tonic value. Where diarrhea occurs, calomel with salol or the beta-naphthol bismuth may be used. The sulphate of magnesia, in some cases, is highly recommended to relieve the constipation of this disease and an occasional single dose of castor oil acts happily to cleanse the whole intestine. Hydrochloric or nitrohydrochloric acid in doses

suitable to the age of the child are very useful agents. The various bitter tonics, such as *nux vomica*, gentian, or quassia, are valuable in these cases.

GASTRIC ULCER.

Although ulcer of the stomach is much rarer in children than in adults, it is occasionally met with. Goodhart has reported a case occurring in an infant only thirty hours old. It is said to be rather more common in females than in males. A case occurring in a child two and a half years old is reported by Colgan.

Causes.—The predisposing causes are anemia, tuberculosis, or various conditions of chronic struma and ill-balanced vasomotor control.

Purpura hæmorrhagica is also mentioned as a predisposing cause. In the case reported by Colgan, mentioned above, chronic gastric catarrh seemed to be the predisposing factor. In older children approaching the age of puberty chlorosis often exists, acting either as a directly predisposing element or as a coexisting condition.

Pathology.—Where gastric ulcer occurs in children, the morbid anatomy is practically the same as in the adult. The ulcers may be either single or multiple; where tuberculosis is the cause, they are apt to be multiple. The site of the ulcer is most commonly on the posterior wall of the pyloric portion near the lesser curvature. In appearance the ulcer is usually round or oval in shape, and has a distinctly clear-cut, punched-out appearance, but in rare instances it may be irregular in outline. According to Osler, the floor of the ulcer is formed either by the submucosa, by the muscular layers, or not infrequently by some neighboring organ to which the stomach has become attached by adhesions. In its subsequent course, adhesions may form between the stomach and adjacent organs, particularly the pancreas, the left lobe of the liver, and the omental tissues, providing the ulcer begins on the posterior wall of the organ. Where the disease is superficial and is confined to the mucosa, granulation tissue develops from the edges and the floor of the ulcer, and this scar tissue, gradually contracting, leaves a smooth cicatrix. Where cicatrization does not occur, the ulcer may penetrate the coats of the stomach and death result from peritonitis.

Symptoms.—The principal symptom of gastric ulcer is pain,

which, although more or less constantly present, is exaggerated after taking food. Vomiting is also a common symptom. This may be either violent or amount to nothing more than severe nausea. Anorexia is an almost constant symptom, caused either by the disease itself or by the pain produced by the taking of food. Eructations of gas occur in the majority of cases, and dyspepsia, more or less severe, is nearly always present. Hydrochloric acid is always found in the vomited matter in cases of gastric ulcer. According to Osler, hemorrhage is present in fifty per cent. of all cases. The vomited blood may be bright red in color, although if it has remained for some time in the stomach it undergoes alteration and assumes a brownish hue. Pressure over the epigastric region will generally cause pain. In some cases the symptoms are obscure; thus in the case recorded by Colgan the symptoms began by a slight indisposition, followed in a few hours by general convulsions. When first seen the temperature was 106° F. (41.1° C.) and the pulse 150. Although the condition was temporarily controlled, the child died in a few hours, and at the autopsy a perforating ulcer, accompanied by peritonitis, was found. The entire gastric mucous membrane was in a chronic catarrhal condition.

Prognosis.—Very unfavorable.

Treatment.—Where a distinct diagnosis can be made, the child should be put to bed, and for the first few days nourished by enemata of predigested foods. In young children these should consist of pancreatinized milk, or albumin water, or a combination of both. Later, feeding by the mouth may be gradually commenced; for this purpose small quantities of iced milk have been highly recommended. If this is well tolerated, from a half to two ounces of Benger's food may be given. This latter consists of a partially digested and solidified beef tea. The subsequent diet should consist of bland, starchy foods, or very small quantities of crumbled bread and milk, or minced chicken. A. H. Smith recommends the use of injections of defibrinated blood in doses of from three to six ounces and administered by the rectum. Leube's emulsion of pancreas of the calf has recently been much lauded as a nutritive enema in these cases. About one-half to one ounce is a sufficient quantity for a child of ten years. It is of great importance that the food should be administered in small quantities and at regular, frequent intervals.

Medicinal Treatment of Gastric Ulcer.—As gastric ulcer is nearly always associated with anemia, the medicinal treatment of one is nearly always combined with that of the other. Iron in some form is generally indicated. For the treatment of the ulcer, arsenic probably holds the first place. This is best given in the form of Fowler's solution and in doses suitable to the age of the patient. Bismuth subnitrate is also a useful remedy. Silver nitrate is of great use in relieving the pain and checking the vomiting, and good results have followed washing out the stomach with a 1 : 4000 solution of this salt. Where hemorrhage is a prominent feature, ergotin is of service. Cocain or the fluid extract of coca has also been recommended.

Professor Frazer, of Edinburgh, has confirmed the investigations of other observers and has himself reported a series of cases in which bichromate of potash has given good results in cases of gastric ulcer in adults. The salt is given in doses of from $\frac{1}{12}$ to $\frac{1}{8}$ of a gr. three times a day, the best time for its exhibition being when the stomach is empty. He claims that the drug may be given either in pill or solution.

GASTRALGIA.

Definition.—The term gastralgia is applied to a sudden, severe attack of pain in the gastric region unaccompanied by inflammation.

Causes.—The condition may arise from exposure to cold, by taking cold drinks, especially when the child is overheated or occasionally by getting the feet wet. Not infrequently it appears as a form of neuralgia. Holt states it is common in children affected with malaria, especially at the onset of the attack. The amount of pain may be slight or may be so severe as to cause faintness or marked prostration. No inflammatory symptoms accompany the pain.

Treatment.—The patient should be put at rest in bed and counterirritation over the stomach applied by means of a turpentine stupe, mustard plaster, or hot-water bag. Internally should be given moderate quantities of hot water containing five drops of spirits of chloroform, brandy, whisky, or gin. If the pain is great enough to cause prostration, heat should be applied to the body and all food withheld during the attack. Recurrent cases are best treated by the use of arsenic in the form of Fowler's solution. Attention should

also be directed to the patient's general health and a careful regulation of the digestion.

DILATATION OF THE STOMACH.

Frequently the stomach becomes dilated as the result of long-continued chronic catarrh of its mucous membrane. The condition is most commonly found in rachitic or anemic children. Occasionally it arises from acute gastro-enteritis and cholera infantum. Hirschsprung has recorded two cases resulting from congenital stenosis of the pylorus with secondary dilatation and hypertrophy. Congenital obstruction of the duodenum and ileum has also been adduced as a cause.

Pathology.—As a result of weakness and insufficiency of the digestive fluids, decomposition of the casein of milk and all starchy elements takes place, resulting in the formation of large quantities of gas. These keep the weakened muscular coats continually on the stretch, and, as a result, atrophy of the muscular fibers and glands takes place; such a stomach is never entirely emptied, but always contains more or less decomposing food and mucus. The size of the stomach in this condition is sometimes very great. Thus, Henschel records the case of the stomach of an infant two weeks old the capacity of which was 190 c.c., the normal capacity being 70 c.c., and he also gives an account of the stomach of an infant of three months whose gastric capacity was 485 c.c., the normal capacity being 150 c.c. Other cases showing the great increase in size of the stomach, owing to dilatation, are reported by the same author and others.

Symptoms.—The symptoms of gastric dilatation are frequently vague, and it is not uncommon for the condition to be discovered only at the autopsy. Such symptoms as chronic dyspepsia, regularly occurring discomfort after taking food, and habitual vomiting after meals, may lead us to suspect the condition. The child complains of pain after eating for some days, and then suddenly vomits large quantities of partially digested fermented curds or the remains of other food taken during this time. The tongue is heavily coated, there is frequently constipation, and the child shows symptoms of general nutritional failure.

Diagnosis.—Owing to the obscurity of the symptoms, the diagnosis may not be easy. Sometimes the dilated stomach may be mapped out by percussion, but should the large intestine also be distended, this method of diagnosis in a child is by no means an easy matter; in fact, in the majority of cases it is impossible, as the tympanitic percussion note would be the same over both. It is said that a splashing sound may occasionally be produced by gently shaking the child, but this sound can only be heard when the stomach is full of fluid.

Treatment.—The treatment is that of chronic gastric indigestion. Systematic, well-regulated feeding and the washing out of the stomach are especially indicated. Strychnin or nux vomica, arsenic, and the mineral acids, particularly hydrochloric, are the chief remedies to be employed. Such children should be kept in the best of hygienic surroundings and allowed a life as much as possible in the open air.

DISEASES OF THE INTESTINES.

MALFORMATIONS OF THE INTESTINAL TRACT.

STENOSIS AND ATRESIA.

Narrowing or closure may occur at any part of the intestinal tract. The causes may be divided into congenital and acquired. The congenital form is usually due to the formation of cicatrices resulting from intestinal ulcer occurring during intra-uterine life.

The condition may also arise from the formation of peritoneal bands or tumors arising during intra-uterine life. The acquired form may be caused by chronic intestinal ulcerations or mechanical irritation of the intestines arising during the course of dysentery or certain forms of chronic diarrhea. Occasionally the rectum ends in a blind pouch, without the formation of the anal opening. The rectum may, in this condition, terminate at any point below the sigmoid flexure. In some cases it is attached directly to the floor of the perineum, producing a tumor of the latter, as the meconium collects and distends the blind end of the bowel.

Treatment.—Immediately following birth the physician should

examine the infant to see if the parts around the anus are properly formed. Ordinarily, soon after it is born the child has a free passage of meconium; if this does not occur, examination of the rectum ought to be made with the finger, and should any malformation be found, it will probably be necessary to use surgical means for the relief of the condition. In cases where the rectum ends in a blind extremity which is near to the surface of the perineum, the intervening partition can be broken through by means of a groove director, and an opening made with the finger. If a considerable amount of tissue lies between the surface and the rectum, it will be necessary to dissect systematically upward in search of the rectal opening. In doing this a staff should be placed in the bladder as a guide. Should this fail, Rotch advises that Littré's operation be performed. This consists in opening the sigmoid flexure in the inguinal region and making an artificial anus; or an attempt may be made to cut through the sacrum and make an opening into the gut at this point.

ACUTE ENTERITIS.

Synonyms.—ACUTE INTESTINAL INDIGESTION; ACUTE CATARRHAL ENTERITIS; SIMPLE DIARRHŒA; MECHANICAL DIARRHŒA.

Causes.—Food given in too large quantities, or of a sort not adapted to the age and condition of the child, irregular feeding, the use of a dirty nursing-bottle, the too early and frequent use of table foods, and bad hygiene, may be accepted as the most usual causes of acute intestinal indigestion. Any or all of these causes may increase the severity of the attacks when they occur during the period of dentition, at which time the entire nervous system of the child is readily influenced by external causes, and the digestive tract is in a condition which may be termed hyperæsthetic. Another predisposing cause may be sudden changes of the temperature, especially a rapid change from cool weather to hot.

Symptoms.—The attack of enteritis usually begins with an increased number of stools, averaging anywhere from five to twenty a day. The bowel movements, which for the first two or three evacuations are normal in color and consistency, rapidly change to liquid or soft unformed masses of a greenish or yellowish hue. All the bowel movements contain curds and more or less mucus; later they may be

streaked with blood. The evacuations are preceded by pain and tenesmus. In a few hours the child suffers some loss of flesh, which is particularly manifest in the face and limbs. Where the attack is of short duration, the abdomen may be painless on pressure, but as a general rule the child will complain of some pain in this region on palpation in a few hours if the attack continues. Vomiting may or may not be present. Occasionally the attack is ushered in by convulsions, but this symptom shows a severe degree of intestinal irritation or poisoning. Thirst is nearly always a prominent feature. More or less distention of the abdomen is usually found during the first hours of the disease. The pulse, although increased in frequency during the attacks of pain, is not usually much above normal. If fever is present, it is rarely constant, but some irregular increase of temperature is generally observed.

Prognosis.—The prognosis is favorable under proper treatment. The principal danger consists in allowing the irritating masses of food to remain in the intestines long enough to set up a condition of chronic inflammation.

Treatment.—Where the case is seen early, a dose or two of a dram of castor oil will, in many cases, remove the irritating masses of undigested foods. Where the child is old enough, this may be given in the form of a soft capsule, each one containing five or ten drops of oil. In young children the remedy may be given in emulsion or sandwiched between two layers of five or ten drops of whisky or brandy, or the oil may be introduced into the rectum. Calomel is indicated in these cases; it may be either given alone or preferably in combination with salol or bismuth. Edwards, of San Diego, Cal., recommends the administration of bismuth given in the strength of two to five grs., each dose to be given in a dram of sterilized water; a teaspoonful of this may be given every hour. An effective mixture used by us in hundreds of dispensary cases is: equal parts of lime-water and cinnamon water, of which two drams are given every hour or two, and often three grains of bismuth subgallate are added. Where calomel is used in these cases, the drug acts not only by its laxative effect, but also by increasing the flow of bile into the intestines. Where the amount of pain is very great, the aromatic syrup of rhubarb, in doses of from a dram to half an ounce, will be found useful. Occasionally a few drops of camphorated tincture of opium may be combined

with any of the before-mentioned agents to relieve pain. • It should be distinctly understood, however, that the use of opiates in cases of acute indigestion is not to be encouraged, nor are astringents to be given until the intestine has thoroughly been cleansed of the irritating cause of the attack. In most cases the thorough evacuation of the intestines should be encouraged by copious enemata of boiled water containing a small amount of Castile soap, ten or fifteen grs. of bismuth subnitrate, or one per cent. of sodium chlorid.

The diet is a matter of great consideration. Where the child has been fed by the bottle, all milk, or preparations containing it, should be stopped for six or eight hours. During this time the patient should receive small quantities of sterilized water containing fifteen or twenty drops of brandy. At the end of this period the child may take moderate quantities of beef juice, say $\frac{1}{2}$ of an ounce to an ounce at each feeding, or of finely-chopped beef or mutton. Strongly concentrated broths are useful.

In twenty-four hours after the stools have resumed their normal color the child may be gradually returned to its usual diet ; it is well, however, to give the patient a drop or two of tincture of nux vomica three or four times a day before feeding, in order to stimulate the assimilative action of the intestines. Small doses of calomel or bismuth, or a combination of both, should be given for some days after the attack has ceased. A useful formula is the following :

R. Hydrarg. chlorid. mite, gr. $\frac{1}{8}$
Bismuth. subnit., grs. v.

SIG.—One powder to be given every four hours for five days after the diarrhea has ceased.

We have also found the following to be useful, especially when vomiting is present :

R. Liq. calcis,
Aq. cinnamomi,
Aq. chloroformi, aa $\overline{3}$ j.

SIG.—One dram every ten or fifteen minutes, to allay gastric and intestinal irritation and as an antiseptic.

CHRONIC ENTERITIS.

Synonyms.—CHRONIC INTESTINAL INDIGESTION; CHRONIC CATARRHAL ENTERITIS; CHRONIC IRRITATIVE DIARRHEA; CHRONIC INTESTINAL CATARRH; CHRONIC ENTEROCOLITIS.

Causes.—The causes of chronic intestinal catarrh are: Continuation or return of a series of attacks of acute intestinal indigestion; the continued use of improper foods, especially at the period of dentition. Chronic enteritis may follow any of the infectious diseases, exposure to cold and wet, or bad hygienic surroundings. Chronic intestinal catarrh is fully as common in winter as in summer, although the type seen in the hot months is more severe and runs its course quicker than in cold weather. The disease is most commonly seen from the third month to the end of the second year, and is much more frequent in artificially-fed children than in those fed from the breast; indeed, providing that syphilis, rickets, or struma are not present, it is somewhat rare to find chronic intestinal catarrh in breast-fed babies. The majority of cases are caused by attempts at feeding a nursing child on a badly-prepared artificial food—especially condensed milk or tainted cow's milk.

Symptoms.—The diarrhea that has been present during an acute attack continues, or returns after a period of cessation. The bowel movements are watery, or they may occasionally change to semi-formed masses of a grayish-white, putty-like hue and consistence. They contain undigested food and much mucus. Occasionally they are streaked with blood and pus. Green stools are common, and these may last for quite a considerable period, particularly at the beginning of each exacerbation of the disease. The stools are found, on microscopic examination, to contain swarms of bacteria; their odor is offensive and putrid, but rarely do they have the peculiar musty smell of the large, watery passages of true cholera infantum. The number of the stools will usually average from four to ten a day, and are preceded and accompanied by considerable pain and tenesmus. The disease is subject to distinct exacerbations, and it is not infrequent for the medical attendant to imagine that he has the case well under control, and later find, to his discouragement, that the disease has returned with renewed vigor. These cases imperatively require careful attention and patience, not only on the part of the physician,

but also on the part of those having charge of the little patient. While a moderate loss of weight is sure to appear finally, and, indeed, may become very great, it is not infrequent to see patients stand the continued drain on the system from diarrhea and lack of assimilation of food remarkably well. The loss of flesh is particularly noticed in the limbs and face, the former losing their roundness of shape and firmness to the touch and the latter its characteristic plumpness and happy expression. The facial expression of these children is remarkably old, thin, and tired. The fontanel is depressed, and the lower part of the face assumes an angular shape which is eminently characteristic. The abdomen is either depressed or considerably swollen; the child is fretful, cries a great deal, and is extremely restless during sleep—young children tossing and frequently crying out, and older children exhibiting the group of symptoms known as night-terrors. The appetite is capricious, sometimes almost lost and at other times the child manifests a ravenous desire for food. Occasional attacks of constipation are not infrequent. The tongue is red, dry, or may be covered by a brownish or yellowish coat. Relaxation and prolapse of the rectum are not uncommon. The skin is often dry and scurfy. The temperature is generally normal, although short periods of slight pyrexia are not infrequently seen. Many of these cases run their course without gastric complications.

Diagnosis.—Although the diagnosis of chronic intestinal catarrh is by no means difficult, cases presenting the before-mentioned symptoms should be carefully examined before a positive opinion is given. The disease may occasionally be confounded with general tuberculosis with intestinal complications; but in tubercular affections we have the regular daily rise and fall of temperature, the large watery bowel movements, and probably evidences of tubercle in other parts of the body, especially the glands and lungs.

Prognosis.—The prognosis depends in great measure upon the duration of the disease, the general constitutional condition of the child, and the treatment it receives. The coexistence of other diseases, such as syphilis, tuberculosis, rachitis, etc., makes the prognosis more unfavorable. Amid good hygienic surroundings, with careful regulation of the diet and the administration of proper remedies, the prognosis is generally favorable, although the duration of the condition is usually rather tedious.

Treatment.—The success of the treatment of chronic gastro-intestinal catarrh depends far more upon the food and general surroundings of the child, its place of living, its bathing, clothes, etc., than upon the administration of any drugs. In young children nursing from the breast, the composition of the milk should be carefully investigated. The existence of pregnancy, prolonged hard work, nervous excitability, prolonged lactation, and many other causes may so alter the constitution of the mother's or nurse's milk as to produce chronic dyspepsia in the child. In such cases, of course, the diet should be regulated, and, if possible, another wet-nurse should be substituted, or, where the child is nursing from the mother's breast, it should be provided either with a wet-nurse or placed on artificial diet. It is extremely difficult to lay down any fixed rule for the diet of these children. The child should be nourished on that class of foods which is most easily digested and assimilated by the strongest part of its digestive tract. In many cases the stools will contain large undigested masses of casein or fat, or they may be highly acid; especially is this the case where the child has been fed on foods rich in lactose. In this class of cases all milk should be prohibited and the child fed for a considerable period on beef peptonoids, panopeptone, meat extracts, albumin water, broths, or other species of proteid foods. Where the stools are alkaline in reaction, frothy, or putrid, a moderate diet of starchy or dextrinized foods, or foods containing some sugar, will often answer admirably. It must be borne in mind, however, that, as a general rule, no child under eight months of age will thrive continuously on a diet of starch. Modified milk containing a low proportion of sugar and fat and a high percentage of proteids is often of great use, and to this should be added ten or fifteen per cent., by bulk, of lime-water. Peptonized milk, either alone or combined with arrowroot, is sometimes of service, but this diet can not be kept up for long. In older children the diet is a matter of the greatest importance, but it is often very difficult for the physician to control and direct it in a satisfactory manner. All irregular meals, highly-seasoned foods, candies, and most of the sweet cakes must be strictly prohibited. It is far better that the child should occasionally receive too little food than that it should eat food of improper quality, or in quantities too large for its temporary capacity. The following diet

list has been recommended by Starr for these cases, this, however, being subject to modifications and frequent changes.

Breakfast, 8 A. M.—A teacupful of bread and milk; the milk should be rendered alkaline by the addition of lime-water. In not very severe cases a lightly-boiled or poached egg, with one or two slices of bread, made from unbolted flour or stale bread with butter, may be substituted for the bread and milk.

Dinner, at noon.—A lean broiled mutton chop, or a piece of underdone tender roast beef; such vegetables as cauliflower, or a small quantity of well-roasted potato (not new), may be added. A small quantity of bread well toasted, or Zwiebach; occasionally a half an ounce of good sherry well diluted.

At 4 P. M., about twelve ounces of fresh milk, rendered alkaline as above mentioned.

At 7 P. M., supper; a cup of beef tea or mutton broth.

A diet list such as the above may be continued as long as the child does well. Whenever a relapse occurs, a return to a strict diet of modified milk, or, better, beef juice, beef tea, or chicken or mutton broth, given in small quantities at regular intervals, and this plain diet should be continued until the bowel movements have become normal in color, and have been free from mucus for a number of days. The question of the climate and general surroundings of the child is one for earnest consideration. Children with intestinal disease, particularly of a chronic form, do much better in the country than in the city, but they improve more rapidly at the seashore than anywhere else. It is also of importance that such children be kept in the air, and they should be encouraged to play out of doors. Even in winter time, providing the weather is not too windy or damp, they should be kept in the open air for a considerable portion of each day. The clothes should be of wool, and so constructed as to impede as little as possible the free movement of the limbs.

Medicinal Treatment.—The medicinal treatment should be directed first toward thoroughly clearing the intestinal tract of the irritating cause of the disease, and, secondly, stimulating the digestive and assimilative powers. For the first, laxative doses of castor oil are occasionally of great use. Calomel, also, is an exceedingly useful drug for this purpose. It is best given in small and frequently repeated doses, and may be combined advantageously with salol or the bicarbon-

ate or phosphate of sodium. Beta-naphtol bismuth, in doses of from one to five grains repeated every few hours, has been highly recommended by Dr. Lewis Fischer and others. The following prescription is recommended by Rotch :

Podophyllin, 1 grain
Alcohol, 1 dram.

Give from three to five drops, according to the age of the child, repeated morning and evening, the dose to be lessened if it causes more than two discharges a day. Tonics, and particularly arsenic and nux vomica, should be given. From one to five drops of the latter (nux) given immediately after taking food forms an excellent digestive tonic. Of the intestinal astringents, bismuth is probably the best; doses of from five to ten grains of the subgallate, salicylate, or subnitrate, given either alone or in combination with salol, give excellent results. In many cases bismuth may be advantageously administered by means of enemata applied to the lower bowel. Opiates, as a rule, are distinctly contraindicated. Probably one of the most successful methods of treatment is by copious enemata of warm sterilized water or normal salt solution; the latter has been recommended by Fischer, of New York. From three to four quarts of water should be used at each irrigation. They should be given from a fountain syringe, to which is attached a large-sized soft catheter having more than one opening. The child should lie on the nurse's lap, either on its back or in what we have found better positions, namely, on the abdomen or left side. The syringe should be held about three feet above the floor, and the water should be allowed to flow in and out again. It is often necessary to flush out the intestines thoroughly with either plain boiled water or normal salt solution, in order to clear them before administering the enema containing the intestinal antiseptic or astringent. Probably the best antiseptic to be given in this way is a combination of subnitrate of bismuth and salol, or beta-naphtol bismuth. They should be administered in a half pint or so of water, allowed to flow into the intestine, and remain there.

Where anemia is a complication of this disease, and especially if it persists after the recovery of the child, some of the numerous preparations of iron are indicated. While, as a rule, cod-liver oil or any

of the vegetable oils are contraindicated when administered by the mouth, yet not infrequently we find excellent results following inunctions of these applied to the abdomen, or over the body generally. The benefit of these inunctions is undoubtedly increased when accompanied by massage.

ACUTE MILK INFECTION.

Synonyms.—CHOLERA INFANTUM; THE TERM "CHOLERIFORM" IS SOMETIMES USED.

The disease here described as acute milk infection is that form of acute intestinal poisoning produced by those bacterial toxins peculiar to milk and foods containing milk. It is the true cholera infantum as described by Vaughn, of Ann Arbor, and others.

Acute milk infection is a disease peculiar to the summer months, and is found only in children fed on an artificial diet of foods containing milk. It occurs very rarely in children fed upon breast milk, although occasionally such cases have been reported.

Causes.—The specific poison, bacterial or chemic, producing cholera infantum has not yet been isolated. In the healthy nursing child two forms of bacteria are constantly found in the intestinal tract; these are the *Bacterium lactis aerogenes* and the *Bacterium coli communis*. These are sometimes called the "obligatory milk feces" bacteria. According to the researches of Baginsky, Booker, and others, the upper part of the duodenum is quite free from micro-organisms, while the lower part of the small intestines contains considerable numbers of the *Bacterium lactis aerogenes*. The *Bacillus coli communis* has been found chiefly in the lower part of the ileum, and still more abundantly throughout the entire length of the colon. Whether or not the poison is due to a sudden increase in number of these bacteria or their ptomains, produced partly by the continued high temperature of the summer, and aided by a fermentation of artificial foods in the intestines, or whether it is due to some specific microbe which has its existence only during the warmer months, is still an unsettled question. Certain it is, however, that true cholera infantum—acute milk infection—is almost solely found during the summer months. It is a disease much more common in cities than in the country, and the number of cases increase during the prevalence of a temperature above 70° F.

(21.1° C.). The children of the poor are more often attacked than those in better circumstances, and, as before stated, it is found almost entirely in children fed on artificial foods containing milk or on unsterilized cow's milk, and some of the very worst cases that we have seen have been among infants fed on condensed milk. It appears most frequently from the third month to the end of the second year. Although the toxic bacteria are most frequently introduced into the system in the manner before stated, they may enter in other ways, as by the anus, or by the mouth from the nipple of a mother or nurse whose habits are uncleanly. An infant may infect itself from its own fingers, which in many cases are far from clean.

Pathology.—In infants dying after an acute attack of milk infection of short duration we find a very considerable amount of emaciation, much more marked in the face, however, than in the body; the cheeks and eyes are sunken, the fontanel depressed. If the disease has lasted for some days, the loss of body weight is extreme; the limbs lose their rounded shape, the skin covering the upper part of the thighs is loose and hanging in folds. The face has entirely lost its plumpness and shows extreme emaciation. Upon opening the body, examination will show minute hemorrhages upon the surfaces of the lungs, with evidences of hypostatic congestion at their bases. The same minute hemorrhages are found in the heart, which is usually in a state of diastole, its cavity being filled with blood. The mucous membranes of the stomach and intestines are in a condition of capillary congestion, with small hemorrhagic patches scattered here and there. The contents of the intestines are liquid from an excessive secretion of mucus. Peyer's patches and the solitary glands are swollen. There is marked congestion of the mucous membrane of the entire large intestine, this being greatest in the cecum and descending colon, throughout which ulcers may be found; these ulcers may be single or multiple, and are of varying depth. In many instances catarrhal pneumonia will complicate the later stages of the disease, and in these cases solidification will be found at the bases of the lungs. According to Ashby and Wright, a microscopic examination of the mucous membrane of the intestines shows a general distention of the network of their capillaries and an exudation of leukocytes. This condition exists in the mucous membrane itself, the submucosa, the villi, and between the tubules and crypts of Lieberkühn. The central portions

of the solitary glands are softened, or the softened portion having been discharged, the remains of the glands appear as sharply-cut ulcers.

Examination of the brain shows no specific lesion ; occasionally the sinuses are found distended with blood, or, on the other hand, a condition of cerebral anemia may exist. Ashby and Wright mention one case in which meningitis was present, but these instances are extremely rare.

Symptoms.—No matter how the poison enters the system, the symptoms of acute milk infection are nearly always the same. Occasionally a mild diarrhea may precede the sudden onset of the acute indications by a few days. During this time the stools are more frequent than normal and are green. There may be some vomiting after taking food. It is very questionable, however, whether this preliminary diarrhea is part of the true attack of cholera infantum. Very frequently the disease begins suddenly at a time when the child is in perfect health. The first symptoms are, then, vomiting and purging. The vomiting is intense and continuous. The vomited matter is first composed of the gastric contents, later watery detritus, and, finally, after there is nothing left in the stomach to be thrown off, the attempts at vomiting continue. The child has nausea of the most intense character. The vomiting is increased by the taking of food or drink—in fact, anything put into the stomach is immediately expelled. During these paroxysms the child becomes pale, the lips blue, a dark line is seen around the mouth, and the entire body is covered with cold, clammy sweat. The evacuations of the bowels occur more and more frequently, until they are practically continuous. Their character changes with great rapidity from the normal yellow movement of the infant to the thin, green, spinach-like discharge (decomposed mucus), and finally an almost continual expulsion of large quantities of water mixed with shreds of mucus, which give them somewhat the appearance of rice water ; these discharges have a characteristic musty odor, are acid in reaction, and are composed of serum mixed with epithelial cells and swarming with bacteria. The abdomen in the earlier stages of the disease may be slightly distended and soft, but as the diarrhea continues it becomes retracted. A marked difference exists in the temperature of the surface of the body and of the interior. Occasionally during the first few hours the surface temperature may be

above 98.6° F., but in the majority of cases it does not rise above the normal point. In the algid state of extreme depression it is distinctly subnormal. The rectal temperature will be found to be anywhere between 103° and 107° F. The average duration of the disease is from one to three days, although we have seen cases in which the entire attack, from the first symptoms until the death of the child, has been but six hours. The loss of flesh is appalling, the child frequently changing from a rosy, plump baby to a mere skeleton covered with skin in the course of a few hours. There is probably no other disease, with the exception of Asiatic cholera, in which the emaciation is so extreme in so short a time. This rapid decline in body weight is due to destructive loss of fluids. As the disease progresses, the respirations become shallow and jerky, and the child passes into a state of coma, convulsions, or, rarely, delirium. It is not unusual to find a short interval during which there is a lull in the symptoms. At this point in the disease the child may begin to improve, but much more commonly this interval is quickly followed by an increase in the symptoms of profound nervous depression, the child passing into a state of coma, followed by death. Where the amount of poison is originally very great, the patient may become comatose in a very few hours. These cases are practically hopeless. During the entire attack the thirst is extreme.

Diagnosis.—The diagnosis of cholera infantum should not be difficult, the history of the disease and the intensely acute onset resembling no other intestinal affection except Asiatic cholera. Where the latter disease is epidemic, a bacteriologic examination is the only method of differential diagnosis. Occasionally it may be confounded with thermic fever (sun-stroke), but the discharges of cholera infantum are continuous, and it lacks the severely high temperature which is always found in sun-stroke.

Prognosis.—The prognosis of cholera infantum is always grave. If while the attack lasts the child is fed on milk, the disease is nearly always fatal. The prognosis naturally is more favorable in strong, healthy children than in those who are weakly. A long-continued previous diet of artificial foods seems to make the prognosis less favorable. The symptoms on which to base a favorable prognosis are a slight attack and rapid and steady decrease in the vomiting and diarrhea. The absence of symptoms of profound nervous depression

are favorable. The physician, however, should not expect to save the lives of the majority of the infants affected with this disease.

Prophylactic Treatment.—The prophylactic treatment of acute milk infection consists in the careful attention to the cleanliness of the infant's food and the articles used in the nursing. If the child is fed from the breast, the nipples of the mother or nurse should be washed before and after nursing according to the rules laid down in the chapter on hygiene and diet. If fed from the bottle, the greatest care should be exercised, particularly in summer, in scalding and thoroughly cleaning the nursing-bottle after each nursing. Of the various forms of nursing-bottles on the market, the best is the long, slender, plain glass bottle with a round bottom and holding six ounces. For convenience in preparing the food, the bottle should be graduated in ounces and fractions thereof. The nipple should be of plain rubber. Of all forms of nipple sold, the one with a long tube attached is the most dangerous, as it is impossible to keep it clean. The modified milk or artificial food should be prepared according to the rules laid down in the chapter on infant feeding. At all times, and especially during the summer months, any small digestive disturbance which may make its appearance must receive careful attention, and should a slight attack of diarrhea appear, milk must be stopped unless the child is nursing from the breast, and even then it is better to diminish the number of nursings and substitute definite quantities of beef broth or albumin water for several hours. Very often at this time a dram or two of castor oil, with small doses of calomel repeated once or twice during the twenty-four hours, will end the trouble. It must not be forgotten that cholera infantum leaves the digestive tract weakened for a very long time after the acute symptoms have disappeared; or, again, after a period of lull the symptoms may return with less violence, the child passing into the subacute form of intestinal catarrh.

Treatment of the Attack.—The first indication in the treatment of milk infection, the one that is of the greatest importance, is to remove the source of the poison. Hence all milk must be stopped, nor should any food containing it be given to the child. Nature is already trying to throw off the poison which is in the system by the vomiting and purging. Sterilization or pasteurization of milk does not render it a proper food in this disease. The child should receive no food at all for from eight to twelve hours—indeed, in some in-

stances as long as twenty-four hours—after the beginning of the attack. During this time small quantities of about half an ounce of cold sterilized water should be given at regular intervals, and in order to aid in stimulating the patient brandy or whisky may be added to the water. In some cases we have had favorable results from moderately large doses of alcoholic stimulants, giving say a teaspoonful of good brandy freely diluted in cold sterilized water every hour or even oftener during the period of collapse. The second indication is to aid nature in freeing the system of the poison which is already in it. For this purpose washing out the stomach and intestines gives excellent results. The technic of this is the same as described in the treatment of mucous disease. These irrigations must be repeated frequently. The water must be sterilized and may be used plain, or, what is probably better, should be medicated by the use of calomel and bismuth, or any of the salts of the latter, particularly the subnitrate and the subgallate, or a one per cent. solution of sodium chlorid. The results of these irrigations are twofold: they not only aid in clearing the intestines of the poisonous materials, but also by the absorption of at least a quantity of the solution injected assists in keeping up the amount of water which the system needs and of which it has lost such large quantities by the continuous discharge from the bowels. In order to maintain external body heat, the child should be placed in a hot bath, the temperature of which is to be increased from 95° to 110° F.; the stimulating effect of this bath is increased by the addition of mustard. In some cases placing the child in a hot pack at about 110° F. will cause reaction. This method of stimulation is particularly advised by Rotch.

The stomach can best be irrigated with water containing one per cent. of sodium chlorid, after which three to five grs. of calomel may be similarly administered as advised by Vaughn. The irrigation of the stomach and intestines should be repeated as long as the vomiting and purging continue. In the treatment of cholera infantum drugs must hold a second place; nevertheless, a few are useful. They may be administered by mouth or rectum. In order to somewhat control the large watery movements, good results sometimes follow the injection into the bowels of a pint of cool sterilized water containing fifteen to thirty grs. of tannic or gallic acid. This injection should immediately follow a copious enema of sterilized salt solution. When the

system has suffered a great loss of water, as in fact it always does in this disease, and a considerable degree of collapse makes its appearance, subcutaneous injections of salt solution are indicated, as advised by Rotch and others. For the relief of vomiting, and also as a cardiac stimulant, Rotch, following the example of Holt, advises hypodermic injections of $\frac{1}{100}$ of a gr. of morphin combined with $\frac{1}{800}$ of a gr. of atropin. Digitalis or digitalin may also be used as a more permanent cardiac stimulant. Minute doses of the arsenite of copper, carbolic acid with glycerin in drop doses, minute amounts of bichlorid of mercury, and many of the coal-tar products have been brought forward as useful remedies, and undoubtedly do have some effect, but all of these must take second place to the mechanical means of treatment by the washing out of the intestines and stomach. As an intestinal antiseptic salicylate of soda has been recommended by A. Jacobi and Emmet Holt. The subnitrate or subgallate of bismuth, in doses of from ten grs. to a dram, the smaller doses to be administered by the mouth and the larger by the intestines, are certainly of some use. Although opium in the early stages of cholera infantum is worse than useless, yet occasionally when the disease has lasted for some days, rectal injections of four or five drops of the tincture in warm starch water will soothe and diminish the irritability of the intestines. Small and frequently repeated doses of calomel ($\frac{1}{40}$ to $\frac{1}{30}$ of a gr. given every fifteen minutes until two or three grains have been administered) have, in the authors' hands, given fully as good results as any other drug used in the treatment of this disease. When the surface temperature is high,—that is, above 103° F.,—an ice cap may be placed on the child's head, or the fever may be reduced by frequently sponging the body with tepid water, followed by friction. No antipyretic drugs should be given, as they do more harm than good. When the surface temperature sinks below normal, stimulants in the form of a hot pack or hot bath should be employed, as has been before stated. Stimulating drugs, such as alcohol, aromatic spirits of ammonia, musk, camphor, or other agents of this class may also be employed. After the vomiting has become less frequent, the child may be given small quantities of nourishment in the form of panopeptone, beef peptonoids, freshly-prepared beef juice, scraped beef, or albumin water. Starch water, arrowroot, any food containing starch, advised by some as a preliminary diet after cholera infantum, have not met with very much success

in the authors' hands. Our own preference is for albumin water, some form of thin beef extract, or light broths.

Not until the child has passed several days without any return of the symptoms of the disease should milk be used as an article of food; it should then be carefully modified, either at home, or, better, at some good milk laboratory. Great care must be taken as to the cleanliness of the food, the bottle, and the nipple. When the child has been fed by the breast at the time of taking the disease, the same rules must be adhered to as when it is fed by the bottle.

SUBACUTE MILK INFECTION.

Synonyms.—SUMMER DIARRHEA; INFECTIOUS DIARRHEA; ENTEROCOLITIS; SUMMER COMPLAINT.

Under the name of subacute milk infection we will endeavor to describe a form of subacute gastro-intestinal catarrh originating from the action of poisons generated by the growth and multiplication of bacteria in the milk from which the child is fed. The poisons are either bacterial or chemic, are not so intense as those producing the acute form of the disease, but are more diffuse. The symptoms not being so severe as to cause alarm in the beginning of the disease, the patient is too often kept upon the same diet of infected milk, and thus continually receives a fresh supply of poisonous material. The number of deaths resulting from this disease are yearly much greater than from the acute form. It is almost entirely a disease of the summer months, and during this time its ravages are fearful. The number of its victims increases as soon as the temperature rises above 60° or 70° F., and decreases correspondingly with each cooler period. It is more prevalent in hot, damp weather than when the air is dry. Like the acute form, it is worse among the poorer classes of our great cities. Just in proportion as the milk given a child is pure and the patient's hygienic surroundings are good, just in so much the danger of this disease is decreased.

Causes.—Subacute milk infection, as has been before stated, is caused by bacteria, the poisons generated by which have been taken into the system in milk. The subacute form may also be but a simple continuation of a mild attack of acute milk infection for a period beyond the ordinary duration of the latter disease.



SUBACUTE MILK INFECTION.
From patient in the Department of Obstetrics and Diseases of Infancy,
Polyclinic Hospital, Philadelphia.

Pathology

Pathology.—Microscopic examination of the stools will show that they contain epithelial cells, crystalline formations, occasionally blood, and in older children fibers of meat. In one case recorded by J. Lewis Smith, he states that he observed particles resembling three or four crypts of Lieberkühn united and probably thrown off as the result of ulceration. Owing to the continual irritation of the intestines, due to the inflammation set up by bacteria and their poisons, and also very probably by the mechanical presence of the bacteria themselves, inflammation is set up, resulting in ulcerations here and there along the ileum and colon. The greatest amount of inflammatory change is generally found in the colon, and here ulcers may be formed either singly or in groups. They may be seen in any part of this division of the large intestine. The upper part of the duodenum and jejunum are generally free from these inflammatory changes.

Symptoms.—The disease usually begins with a gradually increasing diarrhea and some vomiting, both of which are increased after taking nourishment. The vomiting, however, does not always appear, and when it does it is in the more acute form of the disease. The symptoms may develop immediately after nursing, especially where the child is fed from the bottle, or may appear after an interval of cessation following an attack of acute milk infection. In this latter instance it almost invariably shows that the child has been returned too soon to a milk diet. As the bowel movements increase in frequency they will contain large quantities of mucus, undigested food, especially coagulated casein, and masses of fat. Each evacuation of the bowels is preceded and followed by the expulsion of gas. The color of the stools is at first yellow or brown, but soon changes to greenish or greenish-yellow. Occasionally they are at first of a greenish color. Anorexia is present, and the child loses flesh and strength from failure of its nutritive powers. The tongue is coated with a whitish or grayish-white coat. The temperature is always increased during this disease, and its character is such that, except for the irregular time of the daily onset, it might be confounded with the fever of tuberculosis. The temperature is seldom above 102° or 103° F., and may be so slight as to escape detection. During the attack the child is irritable, whining, and crying in its sleep. After each bowel movement it generally enjoys a short period of rest. A considerable amount of flatulence is present, and this increases the

amount of nervous disturbance. From the frequent, irritating discharge from the bowels, the entire buttocks and often the greater part of the posterior surfaces of the thighs are covered with an erythema. Enlargement of the lymphatics of the groin, throat, or neck are not infrequent, and although this is not a serious complication, yet occasionally the glands may suppurate and cause trouble. Various forms of irregular skin eruptions of an eczematous or erythematous character are often seen and boils are a common complication. Aphthous stomatitis is a very frequent and painful accompaniment.

The lowering of the vitality caused by this disease makes the child liable to be attacked by pneumonia, bronchopneumonia, or bronchitis, the last two being especially common. Death may also follow from hypostatic congestion. Other diseases, such as nephritis or tuberculosis, not infrequently appear later in feeble children.

Diagnosis.—The diagnosis should be founded on the symptoms and history of the case. There are really very few diseases with which subacute milk infection can be confounded. From cholera infantum it is to be distinguished by the more gradual onset, its milder symptoms, and absence of the characteristic large, watery stools found in the acute form of the disease; the vomiting and prostration are not so great, nor is the temperature so high as in the latter. From the various forms of obstructions of the intestines it is to be diagnosticated by the fever, the gradual onset, and the absence of the extreme tenesmus, pain, and stercoraceous vomiting, none of which appear in subacute milk infection.

Prognosis.—The prognosis depends on the strength and vitality of the child, on its surroundings, and on the capabilities of those who attend its wants to give it proper food and general care; the outlook for the recovery of feeble children—those who are fed on all varieties of foods and badly prepared milk and living amid unhygienic surroundings—is unfavorable. On the contrary, when the patient can be taken where good pure air can be breathed, especially the air of the seashore or mountains, and fed on properly modified and sterilized milk, the prognosis is fairly good.

Treatment.—As in all other forms of intestinal disease caused by the presence of bacteria and their ptomains, the careful regulation of the diet is the most important consideration. So long as milk is given the child, which is one of the best of all culture media for

bacteria, just so long will the disease continue. The removal of this article of diet is as much demanded in subacute milk infection as it is in the acute form. These children, then, should be relieved entirely from a milk diet, and placed upon freshly prepared animal broths. These should be given at regular intervals of three or four hours, for regularity in feeding is of nearly as much importance as the items of diet upon which the child is fed. Albumin water, boiled rice, or arrow-root may occasionally be substituted with benefit for the animal broths. All the above articles should be freshly made. The child must not be placed on a milk diet until the disease is well under control, the discharges from the bowels have become normal in color and frequency and vomiting has ceased. The patient, if living in a crowded tenement, should, if possible, be taken to the country, or at least where it can breathe pure air. Directions should be given the mother or nurse not to hold it in the arms any more than necessary, but to let it lie on a moderately hard mattress where it can have the draft from an open window, or, better, on a hard pillow in its coach in a cool place in the yard, or on the street after the sun goes down. Instruction should be given not to allow the child to have the nursing-bottle at its lips all the time while lying in the coach or on the bed, but it should be fed only at regular intervals, and between these should receive nothing in the way of nourishment. It should have at least one bath daily, and the diapers should be thoroughly washed and boiled. They should be changed frequently. It is also of great importance that the child drink plentifully of water, providing it be sterilized and given in small quantities at a time. A half teaspoonful to a teaspoonful of good whisky or brandy added to each drink is often helpful.

Irrigation of the intestines is of as much importance in the treatment of this disease as in other forms of infective diarrhea. Lavage of the stomach is indicated where the mucous membrane of this organ seems to be involved. Where the patient is seen at the beginning of the attack, the greatest benefit can be derived from the giving of a laxative, such as moderate doses of calomel, with castor oil, and possibly a few drops of paregoric to prevent griping. Where we see the patient later in the disease, which is generally the case, small doses of calomel, combined with powdered ipecac and powdered rhubarb, are probably about as useful remedies as we can give, although the

treatment of this disease by drugs alone is of but little value. The various salts of bismuth and other intestinal antiseptics are of some use, but too much reliance must not be placed upon them. Large doses of paregoric, either alone or combined with chalk mixture, or the various diarrhea preparations should not be given at all. After the disease is thoroughly under control, and the digestion remains weak, such remedies as nux vomica, arsenic, particularly in the form of Fowler's solution, nitromuriatic acid, and others of this class may be used with benefit. Iron may be employed if anemia is present. Cod-liver oil has been recommended, and is undoubtedly of use, but where the digestion is weak, as it generally is, it is best employed in the form of inunctions.

ILEOCOLITIS.

Ileocolitis, the so-called dysentery or dysenteric diarrhea, is an inflammation of the mucous membrane of the lower part of the large intestine (colon and rectum) accompanied usually by a formation of patches of ulceration, which in number may be single or multiple. The disease may be acute or chronic, and while usually sporadic, sometimes appears in an epidemic form.

Causes.—The same causes which in children produce other forms of intestinal inflammation are also active in the etiology of dysentery. Improper feeding with bad milk, bad hygiene, crowding in poorly-ventilated, filthy tenements, and general lack of care are all fruitful factors in the causation of dysentery. The disease is more frequent among the poorer classes, but it will occur in any condition of life where children are not given the proper kinds of food. As a rule, the disease is more common in cities and in the "slums" of cities than in the healthy districts of the latter or in the country. Predisposing factors in the etiology of the disease are all lowered states of vitality, such as those produced by rickets, syphilis, tuberculosis, etc. The disease is probably always bacterial in origin, but, with the exception of the true diphtheric and so-called amebic forms, we can not identify the exact form of germ producing it. The path of infection in the majority of cases is probably through the food or drinking-water. The disease occasionally appears in epidemics, the cause of which is decidedly obscure, unless, like typhoid, it be carried by water, or air infected from a previously existing case.

The croupous or diphtheric form may result from diphtheria in any part of the air-passages, or it may appear as a primary infection of the entire colon or lower part of the ileum or cecum. A rare disease, known as amebic dysentery, has been described by Osler, Holt, Councilman, and others. It is caused by "the *Amœba coli*" (Lösch), *Amœba dysenteriae* (Councilman and Lafleur). Osler describes the ameba as follows: "It is a unicellular, protoplasmic, motile organism from ten to twenty micromillimeters in diameter, and consists of a clear outer zone, ectosarc, and a granular inner zone, endosarc, containing a nucleus and one or more vacuoles." This disease is seldom seen in this country, but it is very frequent in the tropics. The source of infection is probably drinking-water.

Pathology.—The pathology of ileocolitis is considerably simplified if we remember that this disease is in many cases simply a continuation downward along the colon of the same inflammatory process as that producing an attack of enterocolitis; in fact, in the authors' opinion, the chronic form of the so-called catarrhal dysentery usually begins in this way. We find the mucous membrane of the colon and rectum congested to a very marked degree, or occasionally the inflammatory condition may extend upward as far as the ileum, or in bad cases the whole large intestine may be involved. The mucous membrane is intensely hyperemic, and this condition may be limited to circumscribed areas or may be general. Small hemorrhages sometimes take place into the mucosa or submucosa. The mucous membrane in the parts affected is covered with a thick, sticky mucus, which in some cases is extremely adhesive and hard to remove. The color of the mucous membrane varies from bright red to purple, and is seldom uniform in color. The solitary lymph follicles along the colon are swollen, and each is surrounded by an area of hyperemia, and in many cases the breaking down of these glands occurs later, producing an ulcer. These ulcers may be either single or multiple and often extend considerably in size after they first begin, or in some instances two or more may coalesce, forming one large, irregular, ulcerative patch, which may be simply confined to the mucous membrane, or, proceeding deeper, may involve the submucosa, or even perforate the entire wall of the intestine. The mesenteric glands are enlarged and softened. The liver is usually congested, although anemia of this organ may be present, as in the case recorded by Busey. Suppuration of the kidney

may also occur. Examination of the brain will not infrequently show one or more thrombi in the sinuses of the dura mater. In other cases inflammation of the brain structure, or, on the contrary, cerebral anemia, may be found.

Croupous or diphtheric dysentery is the name given to a variety of the disease which is associated with the formation of diphtheric ulcers occurring in the same part of the intestine as do those of the catarrhal form. These patches are covered with a tenacious, grayish-white membrane which, when removed, leaves a bleeding ulcer. The membrane is composed of fibrin, necrotic cells, and blood-corpuscles. Both the mucosa and submucosa undergo considerable infiltration and thickening. Between the patches the mucous membrane is congested and more or less roughened. The pathology of the amebic form is as follows :

The lesions are principally found in the lower portion of the ileum and colon, and consist of small elevations appearing along the mucous membrane associated with infiltration. The ulcer first begins as a small papule, the upper part of which sloughs off, leaving a grayish-yellow ulcerating surface. Amebæ are found in the tissues in and around the ulcers, in the lymphatic spaces, and occasionally in the blood-vessels. Multiple abscesses arising from the same cause are usually found throughout the liver and occasionally in the lungs.

Symptoms.—In the so-called acute catarrhal form of ileocolitis the attack begins suddenly with diarrhea, accompanied by great tenesmus followed by chills and a moderate rise of temperature. As the disease progresses the patient rapidly loses strength, the pulse becomes rapid and feeble, and the face presents a peculiar pinched, pale, and anxious expression. The weakness is increased after each evacuation of the bowels, the number of passages soon becoming very numerous. The stools at first contain ordinary fecal matter, but rapidly become smaller in quantity, more liquid, and mixed with mucus, blood, or pus, and in advanced cases contain shreds, which are sometimes described as resembling the washings of raw meat. This symptom is generally associated with considerable ulceration. The urine is scanty and high-colored, and in bad cases there may be absolute suppression. Vesical tenesmus is a common symptom. The abdomen is usually swollen and tympanitic. The tongue is covered with a brown fur along the center, its margin being red. Vomiting may occur, but

is more generally seen in the earlier stages of the disease ; it is generally not severe. If the case progress toward a fatal issue, the respirations become irregular and sighing. The eyes are partially closed and the pupils dilated. Not infrequently the child will die in a state of absolute collapse. Prolapse of the rectum frequently occurs, and is caused by the great state of relaxation in this part of the bowels. In the later stages of the disease convulsions are common, and the child may die during an attack. Microscopic examination of the stool shows large quantities of mucus, with epithelial cells of different types usually found in the lower bowel, blood- and pus-corpuscles, fat, and a large number of bacteria. In the so-called diphtheric form of the disease the symptoms are about the same as before described, except that they are more intense. The amebic form is characterized by a series of symptoms not unlike those of the catarrhal and diphtheric varieties, but are less severe than the latter. Large quantities of the *Amœba coli* will be found in the stools during the diarrheal attack, and will serve to verify the diagnosis.

Diagnosis.—The diagnosis of acute cases of the catarrhal form must be made by the character of the stools and general symptoms. The following are a few of the other types of intestinal catarrh from which it must be differentiated : From acute milk infection it is to be differentiated by its less acute onset, less amount of vomiting, and higher temperature. In dysentery the stools are smaller in quantity, contain blood, mucus, and pus, and have less odor. In ileocolitis there are not the general symptoms of acute poisoning which are always present in milk infection. From other forms of gastric or enteric catarrh dysentery can be diagnosticated by its smaller stools, intense tenesmus, and the amount of prostration following each evacuation. The stools of dysentery are distinctly bloody, and there is less of mucus and water than in the stools of other forms of enteric catarrh. In dysentery the stools lack the greenish or greenish-yellow color of those seen in other forms of inflammation affecting the upper parts of the intestines. Chronic catarrhal ileocolitis might possibly in some instances be confounded with mucous disease ; the latter is, however, a long-continued affection, having less severe symptoms, less tenesmus, the stools containing large quantities of mucus, very little blood, and no pus. In mucous disease the evidences of general malnutrition are greater and more slowly progressive than in dysentery. The

diphtheric form is seldom seen in infants, and, indeed, is very rare, even in older children. Its onset may be either very rapid or slow, but the symptoms are much more severe than those of the acute catarrhal variety. The pseudomembrane found in the stools greatly aids in the diagnosis. Amebic dysentery is a rare disease in this climate. When found, the stools will be seen to have a grayish-yellow color and contain blood and mucus (Adams). Its diagnostic points are the recurring attacks of diarrhea and the presence of amebæ in the stools.

Prognosis.—The average duration of the acute attack of catarrhal ileocolitis is from a week to ten days, and with proper treatment should end favorably. The prognosis varies, however, where the disease is epidemic, the mortality in some epidemics being very high. Even the acute variety may end fatally in from twelve to thirty-six hours. Favorable indications are bowel movements of moderate amount and decreasing frequency, small quantities of blood being passed, with slight tenesmus and not a great deal of weakness following. A good, strong heart action, the absence of nervous depression, and no convulsions are all evidences of a light attack of the disease.

Treatment.—The treatment of ileocolitis may be divided into preventive and curative. The former may be secured by a careful oversight of the child's diet and hygiene, the same rules being followed as have been given in the treatment of other forms of intestinal disease. These rules should be carried out with especial strictness and care during the summer months, extra precautions being taken when the disease is epidemic, remembering especially that no attack of indigestion, however slight, in a child is too small a thing to warrant the attention of the physician. Many a fatal attack of dysentery could be checked in the incipient stage were intelligent medical aid called at this time. When the child has been fed on artificial foods containing milk or starch, it is best to stop these for a few hours and substitute a diet of beef juice or broths. When breast fed, allow the child to nurse at rather more frequent intervals and to take very small quantities at each nursing; but even in this case, if the patient has symptoms of a severe attack, it is better to stop the milk entirely. In older children the diet is to be restricted to the lightest kind of proteid foods. A liberal supply of sterilized water or mineral waters, always given in small quantities and frequently, may be allowed. Bad cases with severe

gastric complications may require lavage, and where the child is unable to swallow it may be fed by a stomach-tube. Rectal alimentation is contraindicated in this disease, and foods which are principally digested in the intestines should be prescribed with great caution or prohibited entirely. As soon as the amount of blood in the stools lessens, pasteurized milk may be given, or, better, the patient should have modified milk prepared in some good milk laboratory, where the food preparation can be as carefully compounded as is a physician's prescription by a first-class apothecary. In many cases the physician should carefully supervise personally the exact composition of each day's prescription for the preparation of the modified milk, regulating and altering the quantities of its constituents as may best suit the feeble digestive powers of the patient. In this disease, as in others of the same class, strict attention must be paid to cleanliness and a good supply of fresh air. If possible, remove the child to the mountains or seashore, the latter frequently proving the better. In both, however, it is hard for the physician to so carefully supervise the diet of the child, for this must receive the greatest care even after the symptoms of the acute attack have ceased. Daily sponge-baths should be given all through the attack. A very important point is the disinfection of the diapers; these should be well boiled and soaked in a solution of corrosive sublimate, carbolic acid, or chlorin preparations as soon as removed.

In dysentery, as in other forms of intestinal inflammation, the greatest benefit is always to be derived from local treatment by intestinal irrigations; here it is of importance that the irrigation, while it should be copious enough to thoroughly flush and cleanse the bowel, should be allowed sufficient means of ingress and egress. It is better that the bowel should not be distended to an extent sufficient to produce pain; and it should also be remembered that the lining of the large intestine is thinned by ulceration, so that there is always at least a moderate danger of perforation where the liquid is forcibly injected or the bowel is overdistended by too much fluid. Irrigation can best be accomplished by a soft-rubber two-way catheter, or by using two ordinary soft-rubber catheters of about numbers 12 to 14 of the French scale. Through one of these the irrigating fluid is to be introduced while the other is for the return flow. These should be well oiled and introduced with very great gentleness to a distance of four or five inches. A quart of water may be used in each irrigation in a

child from two to five years old. The return flow must be watched to see that the fluid returns about as fast as it flows in. The gravity or bag syringe is the only safe form to use for this purpose, and the reservoir should not be over three or four feet from the floor. The water used in the irrigation may be medicated with any one of the numerous intestinal antiseptics, but in many cases warm sterilized water made slightly alkaline by one dram of sodium chlorid to the quart of water will give good results. Many authors claim to have excellent results by using irrigations of ice water, or by gradually lowering the temperature of the water during irrigation. The number of irrigations must depend on the amount of diarrhea present; as this lessens, they may be given at increasing intervals. Where the pain and tenesmus are increased greatly by the introduction of the tube, the rectum may be anesthetized by cocain in the strength of two to four per cent., the agent being used alone or with carbolic acid; these may be brushed over the mucous membrane or introduced in the form of a suppository with cocoa butter. Some authors contend that the same effect is produced by a small ice bag applied to the anus, or an ice suppository.

Out of all the large number of drugs, antiseptic and astringent, which have been at various times recommended as cures for this disease, there is no one upon which we can absolutely rely as a specific. Complex prescriptions should be avoided, and the innumerable new remedies should be tried with very great caution, as through their use in many cases the physician does more harm than good. Of the astringent antiseptics, the best is probably bismuth and its salts, particularly the subgallate and subnitrate. Ipecacuanha has in our hands given moderately good results, and calomel has probably given the best of all. The following prescription is recommended by Dr. S. S. Adams:

R. Pulv. ipecac., gr. $\frac{1}{2}$
Mass. hydrarg., grs. iij
Pulv. aromatic. comp., grs. iv
Sacchar. alb., grs. xv.
Mix and make into ten powders.
SIG.—One every two hours.

In the beginning of the attack good results are often obtained by administering a dram of castor oil with a few drops of camphorated

tincture of opium, the latter to prevent griping, or a single dose of sulphate of magnesia may prove beneficial. The mineral astringents give their best action after the disease has progressed for some little time, and it is then that the bismuth salts and a few of the intestinal antiseptics, particularly salol, give their best results. For the pain and tenesmus. Analgesic suppositories of the formula below are useful, one every hour or longer :

Cocain hydrochlorate,	1 gr.
Aqueous extract of ergot,	12 grs.
Aristol,	5 grs.
Cocoa butter,	to make twelve suppositories.

Preparations of opium should be used with extreme caution in dysentery in children. Where the disease has progressed for several days, the camphorated tincture may be used with safety, and may be combined in small doses with any of the before-mentioned prescriptions. Naphthol, the sulphocarbolate of zinc, and bichlorid of mercury, have all been used, and have their advocates. Alcoholic stimulants are especially indicated where weakness is great, and hot fomentations may be applied over the abdomen. Ashby and Wright recommend the use of enemata of small quantities of opium and starch water, five or six ounces of warm mucilage of starch and boric acid, with ten minims of tincture of opium.

In amebic dysentery Councilman and Lafleur recommend the use of solutions of quinin, in a strength of 1 : 5000 to 1 : 1000, by intestinal irrigation. Injections are given with the patient in a knee-chest position.

The treatment of diphtheric dysentery is practically the same as in other forms.

AMYLOID DEGENERATION OF THE INTESTINES.

This form of intestinal disease is most commonly found associated with the same changes in other organs, particularly the liver, spleen, and kidneys, where it usually appears as the result of prolonged supuration. More rarely it is associated with syphilis. The ileum is the part of the intestine most apt to be attacked. The disease is rare in infants and is occasionally seen in older children.

Pathology.—The changes begin in the walls of the capillaries and

small arteries of the intestinal villi, but later the submucosa, and even the mucous membrane of the intestine, may be affected. The latter has the characteristic, pale semitranslucent appearance which is found in amyloid degeneration elsewhere. The same chemic tests as are used in the recognition of amyloid diseases of the liver are of service here. Amyloid degeneration of the intestines has no special symptoms.

The treatment is entirely symptomatic.

MUCOUS DISEASE.

Synonyms.—CHRONIC GASTRO-INTESTINAL CATARRH; CHRONIC FOLLICULAR INFLAMMATION OF THE INTESTINAL MUCOUS MEMBRANE; INTESTINAL DESQUAMATIVE CATARRH; CHRONIC CROUP OF THE INTESTINES, ETC.

Under this name is described (Eustace Smith) a form of chronic intestinal catarrh characterized by the discharge from the bowels of shreds or tubes of membrane composed principally of mucin. The passages are preceded by attacks of abdominal pain and are generally not accompanied by fever. The disease usually occurs from the second to the tenth year, but is occasionally found in very young infants.

Causes.—The cause of the increased secretion of mucus is often obscure. It is probable that it is not primarily of bacterial origin, although it is certain that the number and variety of micro-organisms usually found in the intestines are greatly increased in this disease, especially during an acute attack. It seems probable that a general lowering of the tone, or disorganization of the nerve-supply governing the functions of nutrition and assimilation, may be a potent cause. Goodhart believes the disease to be of nervous origin, and attributes the usual combination of vague symptoms to nervous instability, and says that these children are very frequently the offspring of nervous parents, are descendants of families affected with diseases of the nervous system, such as those in which epilepsy, hysteria, insanity, neuralgia, sudden outbursts of temper are found, or families in which gout, rheumatism, or kidney diseases have been transmitted from one generation to another.

Pathology.—The mucous membrane of the intestine becomes thickened, the glandular follicles in both the small and the large intestine, and especially those of the sigmoid flexure and descending

colon, become enlarged and ulcerated. The character of the mucus is, according to Clark, at first clear or jelly-like and imperfectly membranous; secondly, it is semi-opaque or flaky, and, lastly, yellowish-white, tough, and distinctly membranous, adhering closely to the intestinal surface.

Symptoms.—The child's appetite becomes capricious, and, in the course of a few days, fails almost entirely. There is pain or flatulence or both after taking food. Occasionally the child has an almost constant craving for food and will eat large quantities of it. No matter what the condition of the appetite is, the patient fails rapidly and progressively, the loss of body weight being constant. The skin is pale, or of an unhealthy sallow color; very frequently it is harsh and scaly. The urine is dark and highly colored, of high specific gravity, and contains a large amount of urates. Where no complications exist, neither albumin nor sugar can be found. Nervously, the child is erratic and generally depressed, irritable, or melancholic. Infants affected by the disease cry almost all the time with that peculiar whining, irritable cry so commonly found in diseases of the digestive organs. They are peevish and impossible to amuse. Older children are equally cross, or are hysteric, hypochondriac, and with bad memories or melancholia. Insomnia and night-terrors, with incontinence of urine, are almost constant symptoms. Odd, irregular forms of skin affections, particularly forms of herpes, sometimes appear. Occasionally boils and carbuncles are seen. Ulcerative stomatitis is very often present, and, in older children, chorea, defects of vision, muscular tremors, disorders of cutaneous sensation, and in fact all the chain of symptoms known as hysteroid may be exhibited. The tongue is pale and anemic-looking, with deep fissures in its center. A shiny, gum-like coating generally covers it. Occasionally, however, it is clear, stripped of epithelium, and glazed. Aphthous ulcers of the mouth and tonsils are common. The attack is often preceded by symptoms of general indigestion, with a sense of dull pain or uneasiness in the region of the umbilicus or over the head of the colon. These symptoms may continue or be increased during an attack. The abdomen is somewhat distended and tender. The attack may be preceded by some chilliness, during which the child's finger-nails turn a little blue. There is seldom, if ever, any change or rise of temperature. Frequently the temperature is subnormal. Vomiting is infrequent. In one case we

have seen the attack preceded by symptoms resembling catarrh in the upper air-passages. The number of bowel movements varies greatly. Occasionally the child will be constipated, even during the attack, as in a case in the practice of one of the authors. Mildly alkaline enemata will bring away enormous quantities of thin mucus. In other cases the stools are frequently preceded and accompanied by pain and flatulence. The breath is generally offensive, the odor being described by some as being sweet, heavy, aromatic, or resembling that of chloroform. The tonsils are nearly always enlarged and prone to inflammations. The disease frequently occurs in paroxysms, and between these attacks the child's condition may improve; the bowels are more regular, may, in fact, be even constipated, and the stools contain little or no mucus. During the attack the stools are soft, light brown or pale in color, and putty-like in consistence; they always contain large quantities of mucus. Small collections of worms are frequently found in them. A microscopic examination of the stools will show that they are made up of opaque, solid, white masses, molded or flattened, and small flocculent pieces of semitransparent membrane. The pieces of membrane will, upon examination with a low power objective, be seen to be composed of mucous and epithelial cells which have undergone fatty degeneration. Certain vasomotor symptoms, such as a circumscribed flush upon the cheeks, appear especially in the afternoon, and around the mouth there is generally a dusky pallor. Children thus affected generally pick at the nose, showing alteration or irritation of reflex origin in the mucous membrane of the nose,—a group of symptoms which have long been ascribed to the presence of worms.

Diagnosis.—From the color and shape of the pieces of membrane passed, the disease may be confounded with tapeworm, but the characteristic symptoms and the large amount of mucus excreted should serve to differentiate. The diagnosis can be confirmed by the microscopic examination of the discharges. It should not be forgotten that in older children it is possible for one of the forms of tapeworm to be coexistent with this disease. The disease to which the mucous enteritis bears the closest resemblance is general tuberculosis, or pulmonary tuberculosis with intestinal complications. In tuberculosis we have the regularly recurring fever, while in mucous disease there is no rise of temperature, the latter being often subnormal, except occa-

sionally during the attack. It would be well, however, in all cases presenting the symptoms of mucous disease to examine the lungs.

Prognosis.—With a carefully regulated diet and good general treatment the prognosis is favorable, although the disease generally runs a very tedious course. Many cases of this disease continue for years, having occasional recurrences. The fundamental lesion is a neurosis, a lowered tone of the system which may be beyond repair.

Treatment.—The most important part of the treatment of mucous enteritis undoubtedly consists in the careful regulation of the daily life of the child and a strict supervision of its diet. It is impossible to lay down any fixed rule that will fit every case. We must study the character of the individual patient and place the child as far as possible amid those surroundings which are most soothing to its excitable, nervous state. It is of the greatest importance that such children be not forced in their education, nor kept at school for too long hours. They should be allowed as much as possible to live in the open air, and in a climate where the temperature is nearly even throughout the year. In the Eastern States it has been our experience that they do remarkably well at the seashore; however, we find cases that do much better in mountain regions. Almost any condition where they can be allowed to live in the open air, with plenty of gentle out-door exercise, particularly if these exercises are in the form of the ordinary plays and games of childhood, will do the patient good. Young infants should be laid in their coaches and allowed to remain in the open air for as much of the day as possible. At night they should sleep on a moderately firm mattress, in a well-ventilated room, and they should sleep alone. It is of importance that the child receive a daily bath; the water of this bath should be tepid or slightly cool, and its efficiency is sometimes increased by dissolving in it a lump of rock-salt as big as an apple; otherwise the child should be afterward sponged with alcohol and rubbed thoroughly with a moderately coarse towel until the skin is pink. Where there is considerable emaciation and nutrition is bad, the entire body may be rubbed with either olive or cod-liver oil. The ordinary cotton-seed oil—the so-called olive oil of the market—will do equally well. The efficiency of oil inunctions is often increased by the addition of soap liniment or alcohol, in the proportion of about one part of soap liniment to three parts of oil. Unless

there is some special indication for it, it is worse than useless to administer cod-liver oil by the mouth, as fats are but very poorly digested by these children, and there is danger of impairing what little digestive action they have left. Where fats can be assimilated, one of the best formulæ to use is as follows:

Olive oil, 2 ounces
Glycerin, 1 ounce
The yolk of one egg.
Some aromatic substance, as an elixir of pancreatin.

The above, thoroughly shaken, makes a good emulsion and to it may be added one-half minim of creosote to each dram of the mixture. Of this, one teaspoonful may be given three times a day after feeding.

The diet is a matter of the very greatest importance, and here we must again consider the needs of the individual case. It is almost impossible to lay down any general regulations for the feeding of these cases. As a rule, starchy or farinaceous foods should be excluded, and articles of diet rich in fat must be either prohibited or given with the utmost caution. Generally speaking, a diet-list similar to that given in the chapter on the treatment of subacute gastro-intestinal catarrh, is of use here. Milk should be given with caution, and should always be guarded by the addition of bicarbonate of soda, lime-water, or even common table salt. Beef juice, consommé, veal broth, or chicken soup, either plain or with the addition of a small quantity of rice or barley, are useful. In young children milk so modified as to contain a small quantity of fat and a rather high percentage of proteids, answers very well. Where milk can not be so modified at home, the physician's prescription can be more accurately compounded in a milk laboratory. Milk should always be given carefully pasteurized, so as to render it sterile. During an attack it is often necessary to exclude milk altogether. Moderate amounts of alcohol may be given with advantage, particularly in older children; in these cases one-half ounce to one ounce of any good dry wine, diluted in two to three parts of water, may be given with advantage once or twice a day at meals. In the medicinal treatment we have no remedy or combination of remedies that can be claimed as specific. Our object in the administration of drugs should be to keep the intestines as free as possible from infective bacteria and remove the adhe-

rent mucus. The agents which have had the greatest amount of success for this purpose are probably salol, the subnitrate, subgallate, or salicylate of bismuth, naphthol, and naphthalene. The beta-naphtol bismuth has also been greatly praised for this purpose. A few of the formulæ recommended by Dujardin-Beaumetz, Droyxhe, and others are given below :

- ℞. Salol,
Bismuthi salicylatis,
Sodii bicarbonatis, āā gr. cl.
M. Divide into capsules No. xxx.
SIG.—One capsule before breakfast and dinner.
- ℞. Resorcin., gr. ij-vij
Syrup. aurantii, f ̄j
Aqua citronelle, q.s. ad f ̄iv.
SIG.—Three teaspoonfuls every three hours.

As in many cases the bowel movements are highly acid, especially where the child has been for a long time on milk diet, the following may be used :

- ℞. Hydrarg. chlorid. mite, gr. iij
Sodii phosphatis,
Sodii bicarb., aa ̄ij.
M. Divide in chart. No. xxiv.
SIG.—One powder every three hours.
- ℞. Creolin, gutt. j-ij
Syrup., f ̄j
Aqua menthæ piperit., f ̄ij. M.
SIG.—Teaspoonful every two or three hours.

Beta-naphtol bismuth may be given in doses of from two to five grs., according to the age of the child, and repeated three or four times a day. The action of this agent has been highly lauded by many authorities. In the authors' hands it has given moderately good results. We would not consider it a better intestinal antiseptic or superior in any way to the other bismuth salts or salol, or a combination of these two.

Where constipation exists, mild saline laxatives or aperient waters are useful. This class of remedies not only relieve the constipation, but aid in clearing the intestine of a considerable amount of mucus. Probably the most satisfactory method of treatment consists in irriga-

tion of the intestines once or three times a day. This may be supplemented by washing out the stomach.

Gastric lavage has been highly recommended by many authorities. In order to wash out the stomach, a soft Nélaton's catheter of number nine or ten size is attached by a short glass tube to a rubber tube, which in its turn is attached to a glass funnel. The catheter should be gently passed into the stomach of the child and the irrigating solution poured into the funnel from a pitcher; about two ounces may be introduced at a time. After each introduction of the fluid the funnel should be lowered and the contents of the stomach allowed to flow out.

About two liters of water, to which is added a teaspoonful of bicarbonate of soda, or a few drops of a six per cent. solution of sodium benzoate, should be used during the entire irrigation. More liquid should be introduced, and allowed to flow back again until it comes out clear. It must not be forgotten that occasionally considerable shock, and even convulsions, may result from irrigation of the stomach, yet this method of treatment is certainly followed by the very best results. Massage of the abdomen is of undoubted use in these cases. Cutaneous electrization of the abdomen has been recommended by Von Ziemssen and others. This treatment should be administered about half an hour before meals; large electrodes are to be used, one being placed upon the back and another upon the abdomen. General faradism has also been recommended. In cases where anemia is a prominent symptom, tonics such as nux vomica, iron, or quinin are indicated. Hydrochloric or nitrohydrochloric acid administered immediately after meals is of the greatest benefit in many cases. Enuresis and night-terrors can frequently be controlled by diet and by not allowing the child to eat too near its bedtime. Arsenic, belladonna, sulphonal, and many other remedies have been used to control this condition; the last remedy, given in capsules of two or three grs. each, and repeated once, has frequently given excellent results.

CHRONIC CONSTIPATION.

By chronic constipation we understand a condition in which the contents of the bowels are not evacuated with what in a given case would be normal regularity and in less than normal amounts; the

consistency of the evacuations is also increased, so that the effort of emptying the bowel is attended with considerable pain and muscular effort. We must understand by constipation that the number of evacuations is less than would be the normal in a given individual at a given age; thus, during the first year of life an infant may have from two to four, or even five, discharges without being considered to have had more than the normal number. In the second year of life the number of evacuations is generally about two or three a day, and from that time on they will diminish until the individual has one normal stool a day. Constipation may be described under two forms, the atonic and the spasmodic. The atonic form is generally due to a lack of the proper peristaltic motion of the intestines. In the spasmodic form, the fecal movements are usually increased in size, and are much harder than normal; this will frequently produce an irritable condition of the rectum, so that the pain of a bowel movement is so great that the child will not willingly endeavor to have a fecal evacuation.

Causes.—The causes of constipation are varied; thus, the conformation of the large intestines in the child may in itself be a cause, as during this period of life the ascending and transverse colon are shorter and the descending colon longer than in the adult. In the child there are a greater number of curves in the intestinal canal, the cul-de-sac of the sigmoid flexure is deeper, this being especially noticeable just above the rectum. The small space in the interior of the child's pelvis into which many abdominal organs are crowded may tend to produce constipation. The imperfectly developed condition of the intestines themselves, and their lack of general muscular tone, all are factors in the production of flexions or twists, especially in the lower bowel. Food, also, is a very important causative factor, especially where this is in a stage of partial fermentation. Milk itself, usually the proper food for the child, will, when in a condition unadapted to the digestive organs, produce constipation, and a continued diet of cereals is apt to give the same results. A deficient excretion of bile may also be a cause. Various malformations, tumors, etc., may act as etiologic factors. Constipation usually follows the administration of certain laxative drugs after the period of their action has ceased. In the majority of mild cases no pathologic changes are noticed. Where the condition has been intense, and has lasted for considerable

time, there is frequently some irritation of the lower bowel accompanied by a catarrhal condition, giving rise to symptoms that may for a time simulate diarrhea. In bad cases an actual ulceration of the bowel may result, although this is rare.

Symptoms.—The symptoms are for a time more or less obscure. However, there are generally present some headache, restlessness, occasionally a slight rise of temperature, distention and tenderness of the abdomen, and upon examination the transverse colon can generally be outlined by palpation and percussion. In very severe cases there may be dyspnea, and even convulsions of eclamptic type. Palpitation of the heart and vertigo are often present. If the condition continues for some time, the child loses its appetite, becomes restless and fretful, complaining of almost constant abdominal pain, generally expressed by crying and drawing up of the legs.

Treatment.—The treatment should consist in a speedy and thorough evacuation of the intestinal contents. For this purpose the child should be given a full dose of some brisk laxative, such as calomel, and the emptying of the lower bowel facilitated by an enema. This may be composed of plain soapsuds or of glycerin or salt and water; suppositories, too, fill an important place in the treatment of this condition. These may be made of plain Castile soap, of glycerin, or gluten. Injections of plain cold water have been recommended by some. One of the most important agents in the therapeutics of this condition is abdominal massage. This should be applied by some one who understands how to give it correctly; a mother or nurse can readily be taught to do so. The movements should follow the course of the large intestines, and from thence extend over the whole of the abdomen. The application may be made for a period of not over three minutes at the beginning, the length of the treatment being gradually increased from day to day. Both galvanism and faradism of the abdomen have been recommended, but both must always hold a place secondary in importance to massage. The question of food is an important one. This should be regulated according to the needs of the individual patient. Where the child has been for a long time fed on a diet of cereals, a change to a diet at least partially composed of animal broths may give beneficial results; or, on the other hand, not infrequently a slight increase in the quantity of fat or sugar in the food will result favorably. In older children fresh fruits, such

as oranges, grape fruit, etc., are highly beneficial ; stewed fruits also, particularly stewed prunes, stewed peaches, or apricots are of service. In nursing children the condition may sometimes be relieved by the administration of laxatives to the mother, particularly such agents as sulphate of magnesia or castor oil ; also by increasing the amount of laxative foods in the mother's diet. Many drugs have been recommended for the cure of constipation, and in the treatment of the condition by this means great care must be exercised to prevent the intestines becoming so habituated to their use that evacuations can be had only by their aid. If possible, the aim of the physician should be to correct the condition as much as possible by diet and general regimen, so that the continued use of drugs shall not be necessary. Calomel given in doses of from $\frac{1}{12}$ to $\frac{1}{6}$ of a grain several times a day is of great use, but should not be continued very long, partly because of the danger of producing the constitutional effects of mercury. Phosphate of soda also is a remedy of considerable value, especially as it is almost tasteless and may be given in milk or broth. It may be administered in doses of two to five grains, and repeated. Compound licorice powder has also been highly recommended, and may be given either alone or combined with calomel. Its taste is not unpleasant, but in some cases it occasionally excites severe griping. The carbonate and sulphate of magnesium are both very useful agents ; the former has comparatively little taste, and may be given in milk. The taste of the sulphate is rather nauseating, but it may frequently be given in hot water or in combination with tartaric acid and tincture of cardamom, in both of which its taste is considerably disguised. The fluid extract of cascara sagrada, in doses of from one to five drops, is a remedy of considerable usefulness, but we have frequently found that unless its taste is disguised, it produces severe nausea. Some of the cascara cordials, or other preparations of the drug now in market, may be found to obviate this difficulty. Senna is a favorite remedy, valuable to use for a change. The tincture of nux vomica, in doses of from one to five drops, sometimes aids in relieving the condition, and Fowler's solution or other forms of arsenic have proved in the authors' hands of very considerable value. Where flatus is a prominent symptom, such agents as asafetida or turpentine are of use.

INTESTINAL OBSTRUCTION.

Under this title will be described together those forms of stricture of the intestinal canal, either of sudden or gradual onset, which are most commonly found in children. Among these we may include: (1) Strictures arising from organized plastic bands or adhesions, the result of abdominal inflammation by tumors or ulcerations; (2) from strangulations due to various forms of hernia; (3) from intussusception or invagination of the bowel; (4) volvulus, or twisting of the bowel upon itself; (5) mechanical obstructions caused by masses of feces or foreign bodies. The last has been already dwelt upon at some length in the chapter on Chronic Constipation. In children the most common form of obstruction is that known as intussusception, or invagination of the bowel. Stricture resulting from bands of organized lymph, produced through a previous attack of peritonitis, is occasionally found. In the majority of cases the invagination is direct and consists in a slipping of one segment of the bowel within the other (like a glove-finger inverted on itself), the invaginated part being in nearly every case the portion which is furthest away from the anus.

Definitions.—In a certain number of cases the order of the invagination is reversed, the lower segment becoming invaginated into the upper. This is known as retrograde intussusception. The original form, which has been described above, is known as direct intussusception. Intussusception involves three layers of bowel, each layer consisting of all the intestinal coats. The outer layer is known as the intussusciens, sheath, or receiving layer, while the internal is known as the entering layer, which, together with the middle or returning layer, constitute the invaginated part or intussusceptum. The junction of the middle and inner layer is known as the apex. Intussusception may be double or even triple. In the former case five layers of intestines are involved, while in the latter seven layers have been found. While invagination of the bowel may occur in almost any portion, it is stated that one-half of all cases occur at the junction of the small and large intestines. When in this position the ileum becomes invaginated into the colon, the condition is known as ileocolic intussusception. In less than one-third of the whole number of cases invagination takes place only in the small intestine. This is described as ileal or

jejunal intussusception. In a small number of cases the invagination may occur only in the large intestine. This is known as colic intussusception. In most cases invagination begins in the right side of the abdomen, but in all the varieties, except the first, the position of the neck continually changes owing to the following reason: As the entering layer, or intussusceptum, passes into the sheath, it carries with it a certain amount of mesentery, causing a considerable degree of traction, which produces a curving or bending of the intussusceptum toward the mesenteric side of the receiving portion. In the most common variety, the ileocecal, the invagination begins on the right side of the abdomen, but, as the increase is particularly at the expense of the large intestine, the tumor will, by the time it has grown large enough to be felt by palpation, be found on the left side. It is quite possible that in some cases the ileocecal valve, with the apex of the intussusceptum, may protrude from the anus, and occasionally the apex may be detected by digital exploration of the rectum when actual extrusion does not take place.

Causes.—*Predisposing.*—It is a well-assured fact that intussusception occurs more frequently in infants and children than in adults, and in males more often than in females. It has been stated ("American Text-book of Surgery") that more than fifty per cent. of patients are under ten years of age. It is without doubt the most common form of intestinal obstruction in children. Heushner states that three-fourths of all cases of obstruction of the bowel occurring in childhood are from intussusception. The probable reason for this may be that the colon during infancy is of greater length than in the adult, while the mesocolon is wider, thus making easier a displacement of the former.

Exciting Causes.—The exciting causes of intussusception in many cases are obscure. According to some authorities, a portion of the bowel may suddenly descend into a more or less paretic section below it, or the intussusceptum may be drawn into the intussusciens by a more active peristaltic action of the latter. Among other exciting causes may be mentioned a tumor of the bowel, general lack of tone, such as may occur from a state of poor nutrition, chronic diarrhea, or constipation.

The post-mortem appearance of intussusception will show an elongated tumor, usually on the left side of the abdomen. The invagination will produce the appearance as though the intestine was abnorm-

ally short. Above the point of obstruction the intestine is usually dilated and filled with gas and feces, while below it is generally empty, or in some instances may contain a small quantity of bloody mucus. The sheath is distended and frequently ulcerated, and there may be symptoms of general or local peritonitis. The intussusceptum is described as being commonly of a deep-red color unless gangrene has set in, when it is black or greenish-black in hue. The surrounding serous layers become in a short time so united under inflammatory action as to prevent reduction of the invagination. Perforation of the intestine from ulceration may take place, or a stricture occur as a secondary consequence of inflammatory action.

Symptoms.—The most prominent symptom of intussusception is pain. This pain is generally of sudden onset, beginning in the region of the umbilicus, and is at first paroxysmal and very severe. Occasionally it may radiate from the back forward. As the disease progresses, the paroxysms of pain become merged together, until finally it is constant. Each onset of pain is accompanied by a discharge from the rectum of a quantity of mucus and blood. In infants and young children the symptoms are more acute than in older children, and the pain more paroxysmal in type. Between the attacks the child is quiet, but while the paroxysm is in progress the patient screams and assumes the characteristic position of intense abdominal pain—namely, the dorsal position with the thighs drawn up on the abdomen and the legs flexed against the thighs. Nausea and vomiting appear early as a symptom, and are frequently most exhausting. The vomited matter consists first of the contents of the stomach, but later frequently becomes stercoraceous. Rectal tenesmus of severe type is generally present. The abdomen is distended and tympanitic, and on the left side, usually in the iliac region, will be found a tumor which is often quite well marked, and is associated with a corresponding flattening on the right side of the abdomen. Extreme tenderness is manifested over the seat of the tumor, although the entire abdomen is tender to the touch. This is especially the case in the later stages of the disease, or where peritonitis has set in. The pulse is quickened, and as the condition progresses has all the characteristics of the pulse of abdominal inflammation. The temperature is raised usually to about 101° to 103° F. The mind is clear; the countenance, while generally tranquil between the attacks of pain, will, if the condition con-

tinues for some time, assume the peculiar pinched expression always seen in peritoneal inflammation. The amount of tympanites is only moderate, and indeed may not be present. There is only one sign which is frequently noted—namely, the depression in the right iliac fossa. This is sometimes known as the sign of Dance (*signe de Dance*). The symptoms may subside gradually if the attack progresses to a favorable termination. Where the pain ceases suddenly, it is usually a sign that gangrene has occurred in the constricted portion of the bowel; this may be followed by a discharge of the gangrenous portions and a subsequent recovery. Very frequently a sudden break in the temperature, accompanied by cessation of pain and rapid thready pulse, points to the onset of collapse and death. Partial or entire suppression of urine may occur.

Diagnosis.—Intussusception can be differentiated from (1) colic; (2) enteritis or dysentery; (3) fecal impaction; (4) appendicitis. From *colic* it may be distinguished by the vomiting, particularly where this assumes the stercoraceous character. The special diagnostic point, however, is the tumor on the left side of the abdomen. The bloody mucous discharge is present in intussusception and not in colic. The general severity of the symptoms seen in intussusception will also aid in the diagnosis. From *enteritis*, intussusception is to be distinguished by the presence of bloody discharge in the latter, the continuance of the fever, and the presence of a tumor. In dysentery there may be a blood-streaked diarrhea, but the violent attacks of pain and the general symptoms of peritoneal involvement are absent. *Impaction of feces* can be diagnosticated by the total absence of the general symptoms of intussusception, and by the fact that the tumor produced by the greatly distended bowel is on the right side of the abdomen. *Appendicitis* may be distinguished by the presence of the tumor in the right side at McBurney's point. About this will be grouped the maximum of intensity of the tympanites and abdominal tenderness. The general abdominal symptoms of an appendicitis which has existed for some time are generally those of suppurative peritonitis.

Prognosis.—The outlook for a fortunate termination without operation is very unfavorable. In this class of cases the best chance for recovery is where the invaginated portion of the intestine sloughs and is passed by the rectum. According to Treves, the mortality in 133 cases in which original operations were performed for invagination

was seventy-two per cent. In cases where reduction was tried and was found to be easy, the mortality was thirty per cent.; or in difficult cases of reduction it was placed at ninety-one per cent. The best prognosis is in those cases which are operated upon early in the disease. In chronic intussusception the prognosis is very gloomy.

Treatment of Intussusception.—When unrelieved, the condition is so rapidly fatal in children that no delay whatever should be permitted after the diagnosis is established, and prompt attempts made to reduce the invaginated bowel. Even a few hours' delay is unwise. An anesthetic should be given, the hips raised up on a pillow, and an injection of warm water given with a fountain syringe. The greatest gentleness must be exercised for fear of rupturing the gut, and the force of the column of water regulated by raising or lowering the bag of the syringe, each two and a half feet of elevation representing about one pound of pressure to the square inch. Injections of warm water containing a teaspoonful of salt to the pint, or warm olive oil, are also beneficial in aiding the reduction of the intussusception.

Inflation of the bowel with atmospheric air administered through a long rectal tube and bellows may be used with advantage in some cases. The inflation of the bowel with hydrogen gas or carbonic acid gas has been recommended, the former by Senn, the latter by Ziernsen, Libur, and Jate.

If this is not successful, the child may be inverted and gentle manipulation of the abdomen attempted. This measure should never be used after the first twelve to twenty-four hours, as by that time, especially if the constriction of the bowel be very acute, softening of the coats will have occurred and the danger of rupturing it is very great.

If this is not successful, immediate abdominal section must be performed and the invagination reduced by direct manipulation.

All of these methods of treatment have their greatest amount of usefulness in the first thirty-six hours of the intussusception. The patient should be allowed but little food, and this should be systematically given and should consist of milk, concentrated broths, etc. No laxative or cathartic medicine should be given by the mouth. Alcoholic stimulants are indicated where the patient is in danger of collapse.

The best chances of success in reducing the intussusception by any of the above-mentioned methods are during the early stages—that is, within the first twenty-four hours. After that time the

efforts of the medical attendant should be directed to sustaining the patient with the hope that the process of sloughing and evacuation of the strangulated portion will occur. During this time the administration of opium is of great importance. The patient should be nourished more by nutritive enemata than by food given by the mouth. The patient's thirst may be relieved by small quantities of cracked ice, or, better still, by rectal injections of water. To relieve the vomiting, the stomach may be washed out by means of the stomach-tube.

Operation for Intussusception.—The abdomen is to be opened in the median line and attempts made to reduce the intussusception, provided the condition of the bowel warrants the belief that the integrity of the intestinal wall is not destroyed. If the operation be done early—within twenty-four to forty-eight hours—and the constriction be not extreme, this may be accomplished. If, however, the bowel shows evidence that its circulation has been materially interfered with, and that there be any suspicion that its vitality is lost, it should be brought up and attached to the wound in the abdomen, an artificial anus thus being established. It would seem inadvisable to attempt an immediate resection of the damaged portion of the bowel, as at this time children are always in profound depression, and their vitality low. At best, children withstand the shock of abdominal operations badly. It is, therefore, best to relieve the immediate symptom in this way, leaving it to a subsequent time to complete the closure of the artificial anus.

VOLVULUS.

The symptoms produced by volvulus, or twisting of the bowel, will depend to a certain extent on the part of the bowel in which the twisting has occurred. Thus, in cases where the constriction is in the small intestine, vomiting will occur early and be persistent and severe. Wahl's sign, which he considers diagnostic, consists in a circumscribed area of tympanites corresponding to the location of the twisting. It is caused by the distention of the twisted loop of intestine by gas. Volvulus is most likely to occur in the lower portion of the ileum and the sigmoid flexure of the colon, and as compared with other forms of intestinal obstruction it is rare. Its causes in many cases are obscure. It has been ascribed to an accumulation of intestinal contents above the constricted portion of the bowel, or in some instances may be produced by adhesions of a

loop of intestine to a portion of the omentum. This condition is so very rare in children that it is practically unknown.

HERNIA.

Inguinal hernia in children may be divided into three classes: (1) The congenital, (2) the funicular, and (3) the encysted, or infantile.

1. In the congenital form a knuckle of intestine makes its way through the open funicular process. In cases where it passes into the scrotum, it will frequently envelop the testicle.

2. In the funicular variety the hernia passes down the open canal but does not envelop the testicle because of the closure of the funicular process above the testicle by the tunica vaginalis.

3. The infantile form is the rarest of the three varieties. In this the funicular process is closed above, but not below, and the intestine is encased in a pouch of peritoneum, forcing its way into the process and thence descends (Rotch).

Symptoms.—In male children a soft round tumor will be felt extending from the internal abdominal ring into the scrotum. By proper manipulation this tumor can be easily made to disappear as the gut passes into the abdomen through the abdominal ring. In doing so it will give the characteristic gurgling sound. The testicle may be difficult to outline, but it will be found above and behind the tumor. In female children the labium majus will be distended by the knuckle of intestine, which is generally quite easily reduced. Usually in both sexes the tumor consists of intestine alone, but occasionally some peritoneum may descend with it.

Diagnosis.—The condition with which hernia is most likely to be confounded is hydrocele.

HYDROCELE.

1. Translucent by transmitted light.
2. Always dull on percussion.
3. Where reduction is possible, the fluid passes back slowly and noiselessly.
4. No impulse by coughing.
5. The ring is empty.

HERNIA.

1. Is opaque.
2. Always resonant.
3. The hernia passes back quickly and gives the characteristic gurgling sound.
4. An impulse can be felt when patient coughs.
5. The ring is filled with the neck of the tumor.

It should be remembered that these two conditions are occasionally associated.

Prognosis.—The outlook for cure in hernia is very good providing the child wears a properly-fitting truss until the ring has had a chance to close. Strangulation is much rarer in children than in adults.

The **treatment** should consist in the prevention of constipation by the use of proper foods and medicines. The hernia should be reduced and a proper truss fitted.

The Radical Cure of Inguinal Hernia.—For many years past various operations have been devised for the radical cure of inguinal hernia, but failures were frequent and the risk to life was too great for their general acceptance. We now have, in the methods of Bassini and Halsted, which are similar in principle, the means of effecting a radical cure of this distressing and dangerous affection.

These methods consist in freely opening the inguinal canal, ligating the sac, transplanting the spermatic cord, and bringing it out at a point above the internal ring; then by means of buried sutures firmly uniting the tissues and thus obliterating the normal inguinal canal.

The results following these operations in many thousands of cases in the hands of hundreds of operators throughout the world have been so uniformly successful, both as regards final and permanent results in effecting a radical cure, that we are no longer justified in refusing our little patients the benefit of this method of treatment.

While it is true that a large majority of the cases of inguinal hernia in children recover simply by the aid of a properly-fitting truss in the course of one or two years, persistence in the use of this method should not be carried beyond this period of time.

It is not fair to permit a child to suffer all the discomforts of wearing a truss for many years, and during this time risk the grave dangers of strangulation, when we have it in our power, by these two safe methods of operative procedure, to effect a certain and permanent cure.

The mortality, when modern methods of antiseptic cleanliness are carefully carried out, is almost nothing,—far less, indeed, than risks of strangulation which the child runs with even a perfect truss.

FEMORAL HERNIA.

In this form of hernia the intestine passes under Poupart's ligament and makes its way through the femoral canal, showing itself directly

under the saphenous opening. In femoral hernia the tumor is always on the outer side of the spine of the pubic bone. This form of hernia is much rarer in children than is the inguinal form, and is always acquired, never congenital. The treatment consists in the wearing of a suitable truss.

DISEASES OF THE RECTUM.

PROLAPSE OF THE RECTUM.

Causes.—Prolapse of the rectum usually arises from a condition of atony following protracted diarrhea. It is not uncommon also in attacks of diarrhea following long periods of constipation. Violent attacks of coughing, as in pertussis, may produce prolapse of the rectum. The condition is not uncommon in children affected with chronic intestinal catarrh, and is sometimes seen following the violent diarrhea of milk infection.

Symptoms.—The bowel can be recognized appearing as a tumor through the anus; the mucous membrane is usually of a bluish-red color from the interference with its circulation.

The **treatment** consists in the removal of the causes. Constipation should be prevented or relieved by the use of enemata; later the bowel movements should be kept liquid or semiliquid by the use of laxatives. The prolapse should be replaced and a return prevented by the use of rectal injections or suppositories containing some astringent such as vinegar, alum, tannin, etc., or the child should evacuate the bowels while lying down, using pads or cloths to collect the feces.

The tone of the intestine should be restored as much as possible by the use of cold-water injections and by the continued use of astringents such as strychnin or nux vomica. Occasionally it is necessary to keep the bowel in place by the use of a pad and T-bandage.

The best and most satisfactory method for treating surgically prolapse of the rectum is by the actual cautery,—linear cauterization of the mucous membrane of the prolapsus, extending well up the bowel,—but great care must be exercised not to interfere with the sphincter muscle, and not to cauterize too deeply. This should be tried in

all cases before the more radical operation of excision be undertaken. This latter procedure should only be performed by a surgeon of wide experience, and if the peritoneum be opened, the danger to life is materially increased.

RECTAL POLYPI.

Polypoid tumors of the rectum may appear either in the pedunculated form or as simple hypertrophic growths of the rectal mucous membrane. They are not at all uncommon during the early years of life, in fact, some authorities think they are more usual then than at any other period. The characteristic symptom is hemorrhage, which may occur at any time, but is increased during evacuation of the bowels, at which time there is also great pain. Rectal polypi are of various sizes and, according to Rotch, may be of the myxofibromatous or adenomatous variety.

Their treatment consists in removal either by section or by twisting them off.

Hemorrhoids and fistulæ in ano are not very common during childhood and their treatment is the same as in the adult.

PROLAPSE OF THE ANUS.

Prolapse of the anus may be partial or complete. In the first variety, the mucous membrane is sufficiently everted to protrude beyond the sphincter. In the second, there is an invagination of the rectal wall which may be, in some cases, of considerable length.

Causes.—The most common predisposing cause of prolapse is any condition which lowers the tone of the rectal mucous membrane. It is, therefore, very commonly found during conditions of prolonged lowered vitality. The absorption of fat in the ischiorectal region is also a predisposing factor, occurring, as it does, in all diseases accompanied by great depression.

The most frequent exciting cause of anal prolapse is severe and continued straining and bearing-down efforts during attempts to evacuate the bowels. Phimosis, stricture of the urethra, and stone in the bladder are also given as exciting causes. It very often accompanies the more chronic forms of catarrh of the lower bowel, especially dysentery, for the reasons which have been given above. Prolapse of the anus may

be found at any period of childhood, but is most common during the second and third years.

Symptoms.—Where the amount of prolapsed mucous membrane is slight, a small reddish or reddish-blue ring will be seen around the anal opening. This ring is, of course, composed of the mucous membrane of the rectum. Its appearance will usually occur during the act of defecation. Where a large amount of the bowel is prolapsed, the tumor will be large and decidedly corrugated, the mucous membrane having a deep-red or even a purplish hue. In most cases the bowel is very easily replaced, but the prolapse will return with each attempt to move the bowels. The amount of pain will vary considerably, but in most cases it is enough to give the patient decided discomfort. There will be some tenesmus. In cases where the prolapse has existed for any length of time, a considerable amount of catarrhal inflammation is set up and the prolapsed portion of the gut may become ulcerated and more or less hemorrhage take place.

Treatment.—The first indication is to replace the prolapsed bowel, and this can easily be accomplished by making gentle pressure upon it with the finger, covered with oil or vaselin. The child should lie upon its face across the lap of a nurse while this is being done. To prevent its recurrence, every effort should be made to prevent the child from straining during the act of defecation. Rectal injections of ordinary cold water will, in some cases, act well for this purpose, or injections of olive or cotton-seed oil are sometimes of use. In some cases, where the mucous membrane is rather hard to replace, cold applications in the form of ice poultices or cloths soaked in cold water will be found helpful. Frequently the bowel will prolapse with every defecation. In these cases the child should be made to move its bowels while lying on its back, the buttocks, meanwhile, being pressed together by the nurse. Holt recommends that older children should be made to use an inclined seat placed at an angle of forty-five degrees, and after the bowel is empty, the patient is to lie on his back for half an hour or more. Patients suffering from prolonged diarrhea should have the parts treated by frequent sponging of ice water or by injections of small quantities of the same in which tannic acid, in the proportion of twenty grains to the ounce, has been dissolved. Suppositories of opium and cocain are often useful, but must be used with care. The addition of the

extract of belladonna will sometimes add to their usefulness. In some cases relief is afforded by strips of adhesive plaster, two or three inches wide, placed tightly across the buttocks (Holt). Rectal injections of five or ten drops of tincture of nux vomica; or $\frac{1}{100}$ of a gr. of strychnin in ice water have been recommended. Where the prolapse resists all other methods of treatment, it has been recommended that the protruding part be touched with Paquelin's cautery.

FISSURE OF THE ANUS.

This condition may be produced by bungling attempts at introducing the nozzle of a syringe into the rectum, or by irritation caused by the presence of intestinal parasites. The most frequent cause is a slight excoriation of the parts by efforts at expelling a hardened mass of feces.

Symptoms.—Where the fissure is of recent origin, the appearance is that of a small opening at the mucocutaneous orifice of the anus. Where the condition has lasted for some time, the fissure may appear as an ulcer with indurated margins. The fissure may contain pus and even blood, both of which will be discharged during the process of evacuating the bowels. The amount of pain is very considerable: often so severe as to prevent the child from making attempts to move the bowels, and from this arises constipation, which aggravates the condition.

Treatment.—The constipation should be overcome by the use of suitable remedies, and particularly by laxative enemata. The local treatment consists in touching the fissure with a solution of nitrate of silver after having washed it out with some non-irritating antiseptic solution. In very severe cases it may be necessary to stretch the anus.

The **prognosis** is usually good.

ISCHIORECTAL ABSCESS.

This condition arises most commonly from inflammation of the rectum. Traumatism may also be a cause. In the majority of cases the abscess is small, circumscribed, and superficial. The prognosis is generally good.

The treatment consists in the evacuation of the abscess under anti-septic precautions.

HEMORRHOIDS during childhood have the same characteristics as in later life. The most common cause is chronic constipation.

The treatment is the same as in hemorrhoids occurring in adults. They are rare in children under three years of age.

INCONTINENCE OF FECES.

Inability to control the bowels is not infrequently seen in children whose powers of resistance are lowered from various causes. Incontinence of feces also appears as one of the symptoms in the paraplegia of certain nervous diseases or any injury to the spinal cord.

The treatment should be directed to the cause. Where the trouble is local, cure may be sometimes effected by the use of ergot given by the mouth or by rectal suppositories; strychnin is a valuable corrective to the lack of tone.

PROCTITIS.

Three forms of proctitis or inflammation of the rectum are generally described, namely: the catarrhal, membranous, and ulcerative. In the catarrhal form the pathologic changes are those usually found in the same condition in other parts of the intestinal tract. The mucous membrane is swollen, of a deep-red hue, with increased secretion of mucus. In many cases the mucous membrane bleeds easily. Where the condition is of long standing, white, or yellowish-white, ulcers are to be found along any portion of the rectum, but their most frequent site is immediately inside the sphincter.

MEMBRANOUS PROCTITIS; DIPHTHERIC PROCTITIS.—It is probable that the great majority of these cases are due to infection of streptococci, although a certain number occur during a general infection of diphtheria. The pathologic changes are the same as those found in the condition known as membranous enteritis.

ULCERATIVE PROCTITIS.—This form of inflammation of the rectum is characterized by the presence of ulcers occurring along the mucous membrane. These ulcers may be superficial or deep, and are usually multiple. The condition is commonly caused by the progression of a catarrhal inflammation into the ulcerative type. The depth of the

ulcers may vary rather considerably. They may be shallow, involving only the mucous membranes, or may extend deep down into the muscular coat. In the latter cases they very frequently become chronic and are of indefinite duration. Ulcers of the rectum may also be of tubercular or of syphilitic origin.

Causes.—Proctitis may be produced by an extension downward of an inflammation affecting the upper part of the large intestine; or by traumatism, as careless efforts at the introduction of a nozzle of a syringe. Intestinal parasites may produce it, and in female children it may be caused by an extension of a gonorrheal inflammation from the vagina or urethra, or by direct infection through the anus. It occasionally follows, or appears during the course of, the acute infectious fevers. A very frequent cause is the use of irritating drugs, either used by injections or suppositories given with the intention of relieving constipation. Holt states that he has seen it produced in an infant a year old by the prolonged use of glycerin suppositories.

Symptoms.—In the catarrhal form the stools are increased in frequency and in the force by which the contents of the bowel are discharged. In this variety there is also usually a discharge of mucus, either in a liquid condition or in the form of a cast, sometimes mixed with traces of blood and preceding the discharge of the fecal contents of the bowel. True hemorrhage is rare. Tenesmus is nearly always present. Owing to the irritating character of the mucus, the external parts surrounding the anus become inflamed. Prolapse of the mucous membrane is not uncommon. The symptoms of the membranous form are very much like those of the preceding variety, with the exception that the discharges from the bowel contain a larger quantity of pseudomembrane.

The most marked symptoms of ulcer of the rectum are pain and hemorrhage. The pain is usually severe and is referred to the region of the anus or coccyx, or the surrounding parts. The hemorrhage is seldom severe, although occasionally quite a large quantity of blood may be passed. It is usually clotted and will accompany every movement of the bowels. In chronic cases more or less pus may be found with each stool.

Treatment.—The indications for treatment are to keep the patient at rest, to aid the digestion as much as possible, and to relieve the local condition. Where the pain is severe, suppositories or

injections of starch water and opium should be used, or cocain may be brushed over the surface of the mucous membrane. Cocain may also be applied in the form of a suppository. Bland, slightly alkaline injections are of great use. They should consist of starch or lime-water, or one per cent. saline solution. Where the rectal discharges are highly acid, the enemata may be made alkaline, or alkalies may be given by the mouth. In order to decrease the quantity of the evacuations, injections of saline fluid should be given and these followed by enemata containing tannic acid in a strength of ten grs. to the ounce. A one per cent. solution of hamamelis has also been recommended for this purpose. The same treatment as is used for the catarrhal form will apply to the membranous variety. Ulcers of the rectum are in many cases obstinate and slow in yielding to remedies. The indications for treatment are rest in bed, a bland diet largely made up of milk, and the injection two or three times a day of boric acid solution. Local applications of a solution of nitrate of silver of the strength of one or two grs. to the ounce may be applied to the ulcer after the bowels have been well washed out. Opium should be given if the pain is excessive.

CHAPTER VIII.

DISEASES OF THE PERITONEUM.

APPENDICITIS.

It has become a custom by the common consent of authorities to apply the name appendicitis to inflammations in and about the vermiform appendix, notwithstanding the fact that inflammation of the cecum, typhlitis, and perityphlitis until quite recently received differential description in text-books. Clinical experience demonstrates that almost invariably instances of inflammatory condition in the right iliac fossa have a common origin in the appendix vermiformis.

Etiology and Pathology.—The causes of appendicitis may be conveniently divided into predisposing and exciting. Of the predisposing causes may specially be mentioned peculiarities of structure, both congenital and acquired. Appendicitis is more common during early than late life, in those who are habitually or periodically constipated, and in those subject to intestinal catarrh.

Among the predisposing causes may be mentioned departures from the normal shape and situation of the appendix, together with conditions of feeble nutrition. These, combined with irregularities in the development of its mesentery, may tend to produce a condition of twisting, as has been pointed out by Broca.*

Accumulations of irritating or poisonous matters within the appendix, and especially collections of feces, may be considered as a predisposing rather than an exciting cause. Indigestion plays an important rôle as a causative factor. Heredity has been mentioned as a favoring cause; thus, Roux quoted by Dieulafoy † says that in his experience heredity shows this in families affected by gout, urinary and biliary gravel, and diseases of this nature. He has proposed to

* "Gaz. Hebdom. de Méd.," Paris, 1896, xliii, 1026.

† "Clinical Journal," London, 1896, viii, 312.

apply the term appendicular lithiasis to the type which produces this effect in the canal of the appendix in the same manner as biliary lithiasis does in the gall-bladder. While it is not possible as yet to place much significance upon this theory, still the thought opens up a wide field for further observation. Traumatism and the lodgment of foreign bodies may also be considered under the head of predisposing causes. Foreign bodies, such as seeds, pieces of hair, glass, pins, etc., are probably occasional causes. Exposure to cold and wet, traumatism, the straining of the abdominal muscles, or abuse of astringent purgatives, have all been described as exciting causes.

Bacteriology.—Studies of the diseases of the vermiform appendix invariably demonstrate the presence of the *Bacillus coli communis* alone in pure cultures or associated with the *Streptococcus pyogenes*. To account for the assumption of virulence of the otherwise harmless bacteria, Dieulafoy* insists that the closure of the canal is the cause of this pathologic change in the bacillus. In consideration of his theory it has been found that the canal of the appendix may be obstructed by the calculus, to which the term "calculous appendicitis" has been applied. These calculi are usually formed singly, but occasionally three or four are seen together. They are made up of a stercoral base with a mixture of calcareous sulphates and phosphates; they also combine chlorids and sulphates, and are of a brownish color and variable consistency. Section of one of them generally shows stratification. They exhibit a low, progressive development in the canal of the appendix. The lumen of the canal may also be obstructed by reason of a local affection causing swelling of its walls. As Rendue† reports, the canal may also be obstructed by fibrinous formations. Lastly, two or more of these factors may be found associated in causing the obstruction. Laveran disagrees with Dieulafoy‡ and insists that the closure of the appendix is the result and not the cause of the inflammation and its sequence. However, the fact remains that from the degenerated condition of the cells of the mucosa of the appendix virulent types of malignant bacteria develop and may penetrate the peritoneal cavity

* "Clinical Journal," London, viii, 310.

† "Bulletin et Memoires de la Société Med. des Hôpitaux," 1896, No. 4, p. 81.

‡ "Bulletin de la Academie de Méd.," Paris, 1896, xxxv, 461.

either through a perforation, or, as shown by Klecki,* through the lymph-spaces of the damaged intestinal walls.

Morbid Anatomy.—Inflammation of the vermiform appendix may be found in any of its classic stages: thus there are recognized the catarrhal, ulcerative, and the gangrenous varieties. All these really are part of one process, differences depending upon the source and virulence of inflammation. Any one of these forms may be circumscribed or diffused. In the catarrhal variety the walls of the appendix are found thickened and hyperemic. The submucosa and muscular coats are infiltrated by embryonic connective-tissue cells. The lumen of the tube is filled with the debris of inflammation, which is thus becoming narrowed, and finally, if the condition continues, the canal may become obliterated. The marked peculiarity of inflammation of the appendix is the rapid involvement of all its coats. The catarrhal stage may end in resolution, or go on to obliteration of the canal and perforation of the tube. When ulceration occurs, the source is in the base of the muscular coat. The mucous and submucous tissues are for the most part destroyed. The ulcer may perforate the appendix, or if healing occurs, stricture of the tissues may ensue. Dilatation of the tube may occur beyond the point of obliteration. In the gangrenous variety, known by some as interstitial appendicitis, a rapid necrosis of all the coats of the gut takes place. In a very large class of cases there may be no foreign body contained in the lumen of the appendix; not infrequently, however, there is found a fecal concretion teeming with virulent bacteria. These, if perforation occurs, exude into the peritoneal cavity starting up intense peritonitis. The organ may be partially or entirely necrosed—not infrequently the entire appendix is detached by sloughing. The general peritoneal cavity becomes walled off by fibrous adhesions, the result of extension of inflammation to the peritoneum. If perforation should occur before this happens, diffuse peritonitis results; otherwise the fibrinous exudate, by causing adhesions between the appendix, intestinal coils, and the abdominal walls, acts as a barrier to general infection. In most cases suppuration quickly follows the serous exudation and a localized abscess is formed. This may break into the general peritoneal cavity or escape through the intestine, or form a fistula through the abdomi-

* "Annales de l'Institut Pasteur," lix, p. 710.

nal wall. Retroperitoneal abscesses occur when the perforation takes place along the line of attachment of adhesions. Hodenpyl* calls attention to the fact that inflammation of the appendix may result from tuberculous or lymphoid ulcers, although this is rarely seen.

Symptoms.—Appendicitis may be divided into two varieties: the catarrhal, the phenomena of which are relatively slight and cases often escape recognition, and perforative appendicitis, producing gravest appearances and effects.

Appendicitis in its incipient stage produces symptoms so obscure and varied in character that they are often either unrecognized or, if seen, their importance is not appreciated. The first symptom of the disease is pain. Its occurrence is generally sudden and unexpected and may be associated with a chill. The pain varies in intensity from mild discomfort to extreme agony, and is constant; in many cases it may, however, be intermittent. At the outset of the disease the seat of pain may be referred to any area of the abdomen, or, as sometimes happens, to the whole abdominal region. No matter where it begins, in a short time it is localized in the right iliac fossa or over the inflamed appendix. Tenderness quickly manifests itself on the right side with its point of maximum intensity in the region of the appendix—that is, at a point near the outer edge of the right rectus abdominis muscle. Its position may be described as being near the center of a line drawn between the umbilicus and the anterior superior spine of the right ileum. This point is frequently called McBurney's point. In the event of the appendix occupying an anomalous position, this point of tenderness will be correspondingly changed. Resistance of the walls of the right iliac fossa becomes first noticeable; when a considerable amount of tenderness is present, the right rectus muscle becomes retracted and tense, so as to resist palpation. The abdomen becomes distended and tympanitic, and a circumscribed swelling can be made out a little beneath the point of greatest tenderness. Gentle palpation will reveal a tumor of oval shape and some tenderness, the length being about two inches. Over the area of swelling the percussion note is varied, this variation depending upon the proximity of the swollen appendix and its exudate to the abdominal wall. In the later stages of the disease fluc-

* "N. Y. Med. Jour.," December 30, 1893.

tuation may, perhaps, be elicited in this area. To guard these tender points and give himself greater comfort the patient lies in the dorsal position with the right leg drawn up. A rapid elevation of temperature is usual at the onset. In the beginning of the attack the fever may reach 102° to 104° F. (38.9° to 40° C.), but later falls one or two degrees. Cases mild in type may not reach more than 101° or 102° F. (38.3° to 38.9° C.) throughout its course, and normal or subnormal temperature is not seldom found in the severest cases. Continued high temperature points to suppuration, and a sudden fall, while indicating in a certain number of cases beginning resolution, not infrequently indicates perforation. The pulse is accelerated, the rapidity depending to a considerable extent on the height of the fever—a rapid pulse with a low temperature demonstrates that perforation has occurred. Vomiting is more or less constant from the beginning of the attack, and occasionally is a source of much distress. Where the attack proceeds favorably, the vomiting usually subsides in the first day or two. Where peritonitis occurs, the vomiting returns and is persistent. The patient is usually constipated, although diarrhea may be present; it is sometimes seen in the late stages of a prolonged attack. The appetite is lost; the tongue is furred and covered by a brownish coat; thirst is generally present and may be intense. The urine is scanty and at times may be albuminous; in the majority of cases it is high colored. In the early stages of the disease the patient may feel a frequent desire to evacuate the bladder. Where the attack proceeds to suppuration, the condition is indicated by rigors, sweats, and considerable exhaustion. In many cases, however, the formation of an abscess is indicated only by the continued elevation of temperature and an increased tenderness over the affected area. The tumorous mass in the right iliac region increases in size, but on account of abdominal distention can only at times be demonstrated with the greatest difficulty. General involvement of the peritoneum may occur at this time from rupture of the walls of the abscess precipitating its contents into the peritoneal cavity, or a general peritonitis takes place almost from the first, caused by the invasion of septic bacteria before local adhesions have been established. Where this happens, the symptoms are those of a severe peritonitis, ending usually in collapse, death almost invariably following. A certain proportion of cases end favorably without treatment, but in these

the symptoms are mild in type, with but little pain and a slight elevation of temperature, which gradually, or sometimes suddenly, falls to normal point. Where the disease has continued for some time and suppuration has taken place, the countenance assumes the characteristic pinched expression seen almost invariably in grave abdominal diseases. The fever may then assume a hectic type and the patient passes into a genuine "typhoid state." Infrequently in this class of cases the tumor in the right iliac region becomes boggy. The skin over it may be congested and slightly edematous. There may be pain in the right knee or ankle. Edema of the right leg may occur.

Diagnosis.—The recognition of appendicitis from its onset is of the utmost importance, and the symptoms most to be relied upon are tenderness of the appendix itself, muscular tension of the right rectus muscle, and fever. Accepting the views of Richardson, sudden excruciating pain, becoming localized in the right iliac fossa, while of great diagnostic value in the recognition of appendicitis, indicates extension of inflammation to the peritoneum and perforation of the appendix rather than gives evidence of the incipency of the disease. Vomiting and diarrhea are early symptoms, but are of value only when associated with the more important diagnostic points enumerated. Palpating the appendix determines the amount of enlargement and also the degree of tenderness which may be present, due to inflammation. Tumefaction and change in the percussion note are not usually recognized before the third or fourth day. Appendicitis must be differentiated from (1) acute intestinal obstruction—the latter occurs with considerable frequency in children, especially infants, and not seldom becomes a possibility to be considered in making a diagnosis: When the obstruction is due to an intussusception, bloody discharges from the bowel are generally present and the tumor, instead of occupying the right iliac fossa, is found either in the median line or more prominently in the left side. The possibility also of detecting the invaginated bowel by rectal examination will aid materially in the diagnosis. (2) When strangulation of the bowel is due to a twist or volvulus the pain is not localized, as a rule; constipation is also more pronounced than in appendicitis. Moreover, in this form of obstruction, as well as in intussusception, the vomiting is apt to be stercoraceous and is persistent. Besides this, where a volvulus occurs, the abdomen is generally distended. (3) Obstruction of the bowel by collections of feces

in the cecum may cause a low grade of inflammation ; this condition can be recognized by its gradual development, the boggy feel of the tumor, which can be felt as an elongated mass lying in a vertical direction. There is absence of a localized point of tenderness and pain, and almost never symptoms of perforation. The inflammatory symptoms are less severe. (4) Acute indigestion and enterocolitis are excluded by the absence in them of tumor, of localized tenderness, the different character of the vomited matter, and the continued diarrhea with mucous stools. The differentiation is often impossible for a day or two. (5) Hip-joint disease and tubercular peritonitis are mentioned as sources of possible error in making a diagnosis of appendicitis, but these can be excluded usually by strictly considering the history of the case, the symptoms, and general physical aspects of both the above diseases. However, it is to be remembered that either or both of these conditions may possibly coexist with appendicitis, in which case a diagnosis is of grave moment and requires much skill. (6) In girls at the age of puberty an abscess of the right ovary might be quite difficult to differentiate from appendicitis ; in fact, the diagnosis could only be settled by vaginal examination. However, it is more common to find appendicitis in males than in females, and besides this the shape of the tumor, and the generally greater severity of symptoms of appendicitis will aid in the diagnosis. It would be well, however, in cases where any doubt exists to settle the diagnosis by vaginal examination, by which means the inflamed ovary can be clearly made out. It may often be impossible, without opening the abdomen, to arrive at a correct diagnosis.

CHRONIC APPENDICITIS.—The terms recurrent and relapsing appendicitis have been used in describing the return of symptoms after the first attack has subsided. One attack predisposes to another in the majority of cases. The inflammatory process of the primary seizure may have entirely disappeared, but with the result of leaving the appendix extremely susceptible to the slightest irritation, so that now and then the patient will suffer from a recurrence of the disease. The symptoms of these relapses may be as severe as the original onset, but as a general rule they are milder in type ; however, the possibilities are always grave. On the other hand, the primary inflammation may subside into a latent or subacute form causing a constant discomfort to the patient. In these cases there is an exacerbation of symptoms at

short intervals. The term relapsing appendicitis has properly been applied to this latter class.

Treatment.—Absolute rest in bed, applications of external heat in the form of poultices of flaxseed or hops, with hot-water bags at the side to keep the poultices warm. Cold, in the form of an ice-bag kept constantly applied, is very useful. No opium whatever should be given for the relief of pain, as this and the tenderness are our only guides for the need of active surgical intervention. Opium masks this symptom, prevents peristalsis, and checks secretion from the intestines and kidneys. The bowels must be freely but gently opened as soon as possible. If the stomach be not too irritable, salines should be given in frequent doses every two hours until free purgation has been accomplished. If the vomiting be constant, or the stomach unable to retain the saline, calomel in small doses, every hour, should be administered until the desired results have been obtained. If, after a number of hours, the calomel does not produce a free evacuation of the bowels, an enema of *hot*—very *hot*—soap and water, to which some glycerin and magnesia sulphate have been added, may be administered, to unload the lower bowel and thus start the intestinal action.

The question of pulse and temperature are of comparatively little importance in determining the need for surgical interference, as both may continue high, and if no opium has been given, the local pain and tenderness diminish.

A sudden relief from pain and a low temperature but high pulse-rate, indicate perforation of the appendix and a probable infection of the general peritoneal cavity.

Of course, a very large number of cases recover from the effects of the first acute attack by these simple measures of treatment, but it is absolutely impossible to take any number of days or hours as a guide for the necessity for surgical interference. The amount of infection of the appendix may be so great that gangrene and perforation may occur as early as fifteen to twenty hours after the first signs of pain, while on the other hand the disease process may be less rapid in its development, and several days may elapse before these changes exist.

When the symptoms persist after free purgation, the pain, tenderness, and increased resistance on palpation in the right iliac fossa increasing rather than diminishing, no time should be lost in attempt-

ing further medical methods of treatment. The abdomen should be opened and the diseased appendix removed.

Evidence of abscess, unless it be absolutely circumscribed, demands immediate incision and drainage. It is not wise to make too prolonged a search for the appendix in the abscess cavity, for by so doing the thin wall of lymph, which is nature's method of protecting the surrounding tissues from infection, may be readily broken through and a general peritoneal infection be inflicted.

If a general peritonitis be present, operative interference is still more urgently demanded, and with fair chances of success if the intestines are not already paralyzed by the infected process. In the latter condition of affairs death is almost certain no matter what course is pursued.

If the general peritonitis is extensive, with pockets of pus here and there among the intestines, an incision should be made in the left iliac fossa as well, and the whole abdominal cavity flushed with sterile salt solution, directing the stream of water from one side and allowing it to flow through the opening on the other. Drainage by gauze and rubber tubing is necessary, no attempt being made to close the abdominal openings by sutures.

TUBERCULOSIS OF THE PERITONEUM.

Tubercular peritonitis is of frequent occurrence in childhood, and in the majority of cases is secondary to a primary focus, which is oftenest a tubercular infection of the mesenteric glands. Munsterman, out of 2837 autopsies, and Boschke in 226 cases of tubercular peritonitis, claim only to have discovered one and two respectively of primary tuberculosis of the peritoneum. The lymph-channels have been proven the common carriers for the transportation of the bacilli from some distant or near focus, such as a tubercular intestinal ulcer, or a caseous degeneration of a mesenteric gland. The genital tract of the female occasionally offers a mode of infection, as is illustrated by the frequently quoted case of Vierrordt. A girl six and a half years old developed tubercular peritonitis while suffering from vaginal discharge in which the tubercle bacillus was found. A good recovery was made after eliminating the vaginal focus of infection. R. Abbe calls attention to the probability of milk food acting as a carrier of

the bacillus, and suggests possible penetration of the intestinal follicles by the bacilli as the most reasonable method for their entrance in certain cases in which no other invading focus can be found.

Pathology.—Tuberculosis of the peritoneum may be but a part of a general miliary infection which, according to Ziegler, is evidenced merely by gray translucent tubercles of small size dotting the entire surface of the peritoneum, but without extensive inflammation. There may be some slight injection of the membrane, the latter being generally transparent, smooth, and glistening. In the form under discussion in which the tuberculous process predominates in the peritoneum, inflammatory changes take place leading to the formation of a liquid exudate. The peritoneum is thickened and opaque, connective tissue being quickly developed, causing this density. Adhesions of the intestines, numerous tubercles and caseous deposits, are to be found imbedded in the infiltrated peritoneum. These are often concealed by the newly-formed fibrous tissues. The exudate, which varies generally in quantity, may be composed entirely of serum, or, on the other hand, may contain fibrin, pus-cells, and occasionally blood-corpuscles. Perforation of the intestines or abdominal wall may take place. The process either ends in absorption of the inflammatory exudate with caseous metamorphosis of the debris, or the infective process may appear in other organs and end life.

Symptoms.—The symptoms will depend upon the character of the pathologic process existing in the peritoneum. If the disease is but a part of a general miliary tuberculosis, the attack is of sudden onset, and the symptoms are those of acute general peritonitis, except when after a short intermission of symptoms a fresh outburst occurs. The fever, which is generally of true hectic character, may, after a time, completely subside, but following this reduction of temperature there is no improvement in the general health. Emaciation becomes marked, and from the coalescence and adhesions of the intestines emesis and obstinate constipation supervene. The infection being general, death usually results from the more acute process in the lungs. On the other hand, where the peritoneum has become infected from the navel, a mesenteric gland, or an intestinal ulcer, the picture presents a slow, wasting disease almost identical in nature with chronic peritonitis from other causes, differing, however, in the fact that the febrile symptoms which at first are hardly perceptible soon become prominent, manifest-

ing themselves by slight exacerbations of the temperature in the evening. Accompanying this rise of temperature there are generally night sweats, the abdomen is extremely prominent, and may or may not be tender. The bowels may be constipated, although, as a rule, diarrhea is present. This latter symptom is likely to occur in paroxysms. Meteorism is marked. The pulse is weak and small, and obstruction to the intra-abdominal circulation is made manifest by enlargement of the external abdominal veins. The little patient is peevish and much emaciated. The thoracic organs are, as a rule, free from infection. Death results from hemorrhage, occlusion of the intestines, strangulation, marasmus, or general tuberculosis, or from exhaustion.

Diagnosis.—This is based upon the character of the temperature, the pain, the extreme emaciation, and diarrhea. Ascites, chronic peritonitis, and abdominal tumors must be differentiated. Many eminent surgeons claim that a diagnosis before abdominal section is but speculation.

Prognosis.—From a medical standpoint the prognosis is extremely unfavorable. Von Strümpell, Kürze, and Ziemssen teach that tubercular peritonitis always ends in death, and Baginski claims never to have seen a child survive from an attack of this disease. From a surgical standpoint the outlook is considerably more favorable. Undoubtedly under suitable conditions, by surgical methods, the tubercular process may be arrested, as is attested by reports from such authorities as Halsted, Koenig, and others.

Treatment.—The medical treatment consists of that described under the head of chronic peritonitis, together with the general treatment of tuberculosis. The indications for an incision and drainage of the abdominal cavity are imperative in all suitable cases, as the best results have been obtained from this method of treatment.

INTESTINAL PARASITES.

The parasites which most frequently infest the intestinal tract of infants and children are the *Oxyuris vermicularis*, or the pin- or thread-worm, the *Ascaris lumbricoides*, or round-worm. Two species of tapeworm are also recognized, the *Tænia mediocanellata*, or beef

tapeworm, and the *Tænia solium*, or pork tapeworm; the *Trichocephalus dispar* is also occasionally met with. None of these parasites are peculiar to infancy or childhood. The pin- and round-worms are, however, so frequently found during the earlier years of life that they are classed as among the parasites peculiar to children. The tapeworm, also, is not infrequently found in intestines of children, but, as a rule, it does not appear in as young children as do the other intestinal parasites.

Oxyures vermiculares are small worms of a pinkish-white color and fusiform shape, which inhabit the rectum, the large intestine throughout its entire length, and the lower part of the small intestine. The female of this parasite, which exists in greater numbers than the male, measures from about half an inch in length, the male being about one-half as large as the female. The female is to be distinguished by its more slender and tapering shape, as well as by its greater length. To the unassisted eye they somewhat resemble small pieces of white thread, hence their name. With a low-power objective the uterine ducts will, in the female, be seen to contain numerous ova, these being ovoid in shape, about 0.053μ in length and 0.028μ in breadth. The most common symptom denoting their presence is a constant itching around the anus. This irritation increases at night, and particularly when the child is in bed. In girls the same irritation appears at the entrance of the vagina, and the parasites themselves may be found here as well as on the buttocks near the anal opening. From the irritation caused by their presence a true vaginitis of catarrhal type may be set up.

The Mode of Infection.—The original ovum is probably carried to the mouth by toys, food, vegetables, drinking water, or on the fingers of those previously infected, and each ovum brings forth a fully developed worm. Very soon the irritation produced by the worm causes the child to scratch about the anus, and numerous ova are thereby lodged under the finger nails to be taken with the food. It is a curious fact that the presence of the worm does not cause irritation unless it is in the lower part of the rectum near the anus. Other than the intense itching, there are no absolutely characteristic symptoms which would point to the presence of the pin-worm. The parasites themselves may be frequently found around the anus and about the vaginal opening of little girls. Where the vagina becomes

infested with them there is set up a vaginitis, accompanied by a very free discharge of mucus, which may occasionally be tinged with blood, caused by the continued scratching. From the same cause the anal region and buttocks may become excoriated, and later a genuine eczema may make its appearance. If the cause is long continued, the appetite becomes capricious, the child loses flesh, becomes nervous, has dark circles under the eyes, does not sleep well at nights, and, as in all other species of digestive irritation, is very apt to pick at the nose. Various other nervous symptoms may appear, such as, possibly, chorea and attacks of fainting. The diagnosis should be based on the discovery of the worms themselves. There are very few diseases with which they could be confounded, except chronic gastro-intestinal catarrh and mucous disease, both of which have more clearly defined symptoms. An enema given will scarcely fail to bring away enough of the parasites to make the diagnosis plain. In female children the irritation of the vagina may be confounded with specific vulvo-vaginitis, but the character of the discharge and the finding of the parasite will not long leave the diagnosis a doubtful question.

Treatment.—The first indication for treatment is to cleanse the bowels thoroughly of these parasites and the mucus that surrounds them. This is best done by the administration of from one to three grains of calomel in combination with from two to three grains of resin of scammony (dose for a child of eight years). Remedies such as spigelia, santonin, and others of the same class are often indicated. These should be given by the mouth in combination with calomel or any agent, such as sulphate of magnesia, which will produce free watery movements. Once a day the rectum should be washed out with a copious enema of cool, weak soap suds, and a soft rubber catheter should always be used in giving the enema instead of the ordinary syringe nozzle, in order that the liquid may be applied as high up in the bowel as possible. A very useful formula to be given by the mouth is the following:

Calomel,	$\frac{1}{2}$ —I gr.
Bicarbonate of soda,	I gr.
Santonin,	$\frac{1}{2}$ —I gr.
Podophyllin,	$\frac{1}{20}$ gr.

Sig.—To be repeated every night for two or three nights (for a child nine to twelve years of age).

Where relaxation of the rectum is present, injections of common salt solution, quassia, alum, tannin, etc., may have a certain effect in relieving this condition. Dr. Charles W. Townsend, of Boston, recommends the injection of one dram of sulphate of iron to one pint of infusion of quassia for this purpose. In order to prevent the transferring of the ova by means of the finger-nails, the hands of the patient should be carefully washed in soap-suds after each movement of the bowels, and the parts around the anus should be well cleansed with soap and water and smeared with an antiseptic ointment. Where eczema is present, the following ointment may be used, both for its antiseptic properties and to allay the irritation caused by the parasites :

Boric acid,	1 dram.
Acetanilid,	20 grs.
Oil of rose,	5 drops.
Vaselin,	2 ozs.

It should be remembered that all means for the transference of the ova should be removed as far as possible. The bed-clothes should be boiled and washed,—in fact, all the clothing and furniture used by the patient should be carefully antiseptized.

ASCARIS LUMBRICOIDES (Round-worms).—The females of the round-worms measure from four to twelve inches in length, and are of a grayish or reddish-white color. They somewhat resemble earth-worms, from which, however, they can be distinguished by their color and the fact that the earth-worm has plainly marked segments which can be seen on close examination. The ascaris is occasionally found in the small intestines in large numbers. They are much given to wandering about and may pass into the stomach, into the large intestine, or gall-bladder. It is said that in rare instances they have been found in the esophagus, in the pharynx, mouth, or even in the lungs. The female can be distinguished from the male by its greater size; it is also more slender than the male, the tail being straight and tapering, while that of the male is curved and more blunt. The ova are produced in immensely large quantities and are passed off in the feces, in which they can without much difficulty be discovered by examination with a low-power objective. They are oval in shape, about $\frac{1}{400}$ of an inch in length, and have thick, transparent coats within which the dark granular contents of the ovum can be seen. The ova, which

are extremely resistant to destruction by external influences, are usually taken in by the mouth from toys, food, drinking water, or the dust which adheres to the fingers. Children in crawling or playing around a room, and thus bearing on their hands a quantity of dust which in many instances has come from the street, may thus carry the eggs of the parasite into the system. It is certain that ascarides are less frequently found among the better class of people, in whom the laws of cleanliness are more strictly carried out, than among the poor and those of uncleanly habits. They are much rarer now in all classes than a score of years ago. Constant bathing, with proper care of the finger-nails of children, and seeing that their food is well cooked, will do much to prevent infection by these parasites. The round-worm is much more frequently found in children after the third year than in infants or adults.

Symptoms.—It is certain that in many cases large quantities of these worms may exist for a long time within the intestinal tract without producing any symptoms at all. As the majority of intestinal parasites are found in children whose digestions are habitually weakened, the lining membrane of whose intestines are continually coated with mucus, in which these parasites thrive, the majority of the symptoms usually ascribed to the presence of worms are due in reality to a chronic state of gastric or intestinal catarrh. The classic symptoms which parents will usually expect us to associate with the presence of worms are a capricious appetite, or in some cases a ravenous desire for food unattended with any increase of bodily weight, or in some cases an absolute decline of it; irregular feverish attacks; disturbed sleep and bad dreams, accompanied by grinding of the teeth; pain in the stomach after taking food, and picking at the nose, and very frequently the passage from the bowels of large quantities of mucus, or, where the parasites are actually present, a number of these or their ova. It will be seen that none of these symptoms described are in any way characteristic; any or all of them may be found in most forms of intestinal catarrh. It can not be doubted, however, that a number of reflex nervous symptoms are, in susceptible subjects, caused by the presence of intestinal parasites, and probably every physician has met with at least one or more such cases, in which symptoms of severe nervous disturbance have been relieved by completely clearing the bowels of these parasites. A very interesting

case has been reported by Townsend from the records of the Boston Children's Hospital, where a girl four years old, previously in good health, was attacked by convulsions and nervous tremors, which were distinctly traced to a large quantity of round-worms in the intestines. Her condition immediately improved as soon as the intestines were thoroughly cleared of these worms, and the symptoms returned as soon as a fresh quantity of the parasites were generated. There is also some danger of occlusion of the intestines, due to a simple mechanical obstruction caused by large masses of worms; thus in Hillyer's case, in which a weakly child of five and a half years was attacked by severe abdominal pain, and upon being given a dose of oil vomited a round-worm. The child died on the following day, and at the autopsy the ileum was found occluded at a point fifteen inches above the ileocecal valve by "a tightly wound ball composed of eight round-worms; forty-two worms in all were found in the intestines. Below the obstruction the intestine was empty, while it was distended above." Round-worms are such wanderers that there is no telling where they may not travel, and set up an irritation by their presence. Thus they may penetrate the cystic or common bile-duct and cause jaundice by stopping the flow of bile. Abscess of the liver has been known to occur from their having penetrated this organ. They have also been known to penetrate the trachea, or even the lung, causing strangulation or pulmonary gangrene.

Diagnosis.—As the symptoms are so very unreliable, a positive diagnosis can only be made by microscopic examination of the feces. With a low-power objective, one which magnifies say about 320 to 350 diameters, the eggs will be easily recognized. Those of the round-worm are to be distinguished from the oxyuris, the former being larger and rounder, while those of the oxyuris or pin-worm are sharp, smaller, and more oval. From tapeworm the ova of the ascaris are to be distinguished by the fact that the latter are rounder; we have, too, in tenia, the expulsion of the segments.

Treatment.—The most successful treatment consists in the administration of santonin, usually combined with calomel or castor oil. Of all the drugs given to cause the death and expulsion of worms, santonin is probably the best. It must be remembered, however, that it is an extremely poisonous drug and must be administered with great caution. The toxic symptoms are gastro-intestinal irritation, muscular

tremor, and a sensation as if the patient were looking through yellow glass. If the poisoning continues, there will be dizziness, extreme dilatation of the pupils, convulsions, and finally loss of consciousness. Santonin is best combined with calomel, from one to three grains of the former being given with a half to a grain of the latter. Townsend, in the "American Text-book of Diseases of Children," gives the exact dosage of santonin as follows: For two years of age, $\frac{1}{4}$ to $\frac{1}{2}$ of a gr.; at six years of age, one gr., and at twelve to fifteen years of age, two grs. In our own experience we have found this dosage to be about correct. The child should receive a dose in the morning and at night, or in some cases three times daily. Some authorities recommend that a dose of santonin combined with calomel or oil should be given at night, to be followed in the morning by sulphate of magnesia or other saline. It should not be forgotten that as the patients who are most commonly infected with these worms are considerably below the average standing in bodily health, this condition should be attended to. Tonics should be administered, and the diet and general hygienic surroundings improved as much as possible. A diet containing a considerable amount of salted foods has been recommended by some authorities.

TENIA (*Tapeworm*).—The two species of tapeworm most commonly seen are the *Tænia solium*, found in pork, and the beef tapeworm, or *Tænia mediocanellata*. Another rare species known as the *Bothriocephalus latus* is sometimes described. Two other rarer forms known as the *Tænia nana* and the *Tænia cucumerina* are so seldom seen in this country that they will not be more than mentioned. The length of the average tapeworm may be anywhere from twenty to fifty feet; they are of a white color, and receive their name from their resemblance to a piece of ribbon or tape. The *Tænia mediocanellata* and the *Tænia solium* are to be differentiated by the shape of the head, and also, to some extent, by the shape and size of the segments, the head of the *Tænia solium* being rather pointed and containing four sucking discs, surrounded by a circle of hooklets. The head of the *Tænia mediocanellata* is much flatter, has four discs, but no hooklets. Both species are composed of a small head about the size of that of a pin or a little larger, and an immense number of segments. Each segment is sexually complete in itself, or what is known as hermaphrodite.

Diagnosis.—The diagnosis can be made by finding the segments and carefully examining them through the microscope. The species can be determined by the difference in the shape of the head already described. Microscopically, it will be seen that in the *Tænia mediocanellata* the lateral branches of the uterus are finer and much more numerous than in the *Tænia solium*.

Mode of Infection and History of Development.—The eggs of the two principal varieties of tapeworm usually find their way into the intestines of their human hosts in the following manner: They are at first most probably contained in manure or fertilizer, and thence are taken into the stomach of the animals most commonly used for food namely, cattle and hogs. Having found their way into the stomach of the animal, the outer coverings of the egg are dissolved, and the embryo set free. The embryo then pierces the stomach walls, and entering the blood current is carried to any part of the animal's body, particularly the muscles, in which it buries itself, forming what is known as a cysticercous cyst. Usually not one but many of these cysts pass into the circulation of the animal at one time. Within the cyst the embryonic or larval tenia grows. These cysts are extremely tenacious of life, and they have frequently been known to remain alive in the tissues of an animal for four or five years. Unless the tissue in which they lie dormant is taken into the human stomach the embryo finally dies, and the cyst becomes calcified. If, however, the meat containing a living cyst is taken into the human digestive organs, the scolex grows rapidly into a mature tenia. The worm grows by the development of those segments nearest the head, these becoming mature as they progress further from the point of origin, and it is from these sexually mature segments that ova are given off. The worm makes its home usually in the upper part of the jejunum, or at least it is here that the head is firmly attached to the mucous membrane by hooklets and suckers. The body composed of a vast number of segments may extend for any distance along the intestine, depending on the length of the animal. Sometimes it may reach as far as the ileocecal valve. The *Tænia solium* is usually found singly, while two or more of the *Tæniæ mediocanellata* are often seen in a single intestine. It is quite possible—indeed it occasionally happens—that the eggs of the tenia, after having been swallowed by man, pass through the coats of the stomach in the same way as in the animal and develop a cysticer-

cous cyst in any part of the body, especially in the subcutaneous or intermuscular connective tissue, or in the eye and brain (Townsend). The cysticercus is extremely resistant to high temperatures, and it is usually by eating improperly cooked beef or pork that the infection takes place. Eating sausages made of raw pork, or raw beef, the latter being frequently used by children resulting in certain forms of indigestion, is a common mode of infection.

Symptoms.—The first and most common indication of the presence of a tapeworm is the finding of the segments or proglottides in the feces. Besides this, there is no regular sequence of symptoms denoting its presence any more than other forms of intestinal parasites. Frequently there may be pain or sensations of discomfort, which are referred to the region of the umbilicus. The appetite may be great, but is accompanied by a gradual loss of body weight. Where nervous symptoms are present, they are usually those previously referred to in the description of the other forms of intestinal parasites.

Treatment.—The treatment should be aimed at dislodging, as quickly as possible, that part of the worm known as the head, and during the administration of remedies for this purpose the feces should be examined with the greatest care by the physician himself. The success of the treatment consists in the careful administration of any one of a very few drugs. Whichever one of these is used, the method of procedure must be thorough. A great deal of the success lies in the patient carefully carrying out the rules laid down for him. The remedies most commonly used are pomegranate, or its alkaloid pelletierin; pumpkin-seed, kousso, the root of the male fern, turpentine, and cocoanut. Of all these, by far the most efficient is pelletierin. This may be given in the form of the tannate, which is an exceedingly efficient remedy, although expensive. The dose of this for an adult is from five to twenty grains; the dose for children, however, should be regulated according to age. The method of administration of this drug is as follows: A preparatory treatment consisting of partial starvation should be instituted for some hours before the tennicide is given. During this time small amounts of food which is principally digested in the stomach should be given. Townsend, in his admirable article in the "American Text-Book of Diseases of Children," recommends that early in the evening the child be given a bowl of beef tea with half a slice of white bread. In a little while

the patient should receive an enema and be put to bed. On the following morning a cup of beef tea should be given, and an hour after breakfast a full dose of the anthelmintic administered, to be followed in an hour by a good active cathartic. Great care should be exercised that when the worm is expelled it is not broken off, and part of it left behind in the rectum. To prevent this it may be necessary to gently dilate the sphincter by means of a rectal speculum. Next in efficiency to pomegranate and its alkaloids is the oil of male fern, *oleoresina aspidii*. The dose of this drug for a child of five years is a teaspoonful. It may be given in four doses of fifteen or twenty grains each a quarter of an hour apart.

CHAPTER IX.

DISEASES OF THE LIVER.

Diseases of the liver are comparatively rare in childhood, and have received, singularly little attention at the hands of systematic writers on pediatrics. Disorders of the liver are more frequently due to secondary changes usually preventable than in those of almost any other organ. The causal processes of these operate over long periods of time, and it is a quality of infantile tissue to escape many of them. Moreover, this very rarity limits the possibility of any one observer coming in contact with many instances of organic hepatic disease, rendering them less ready to invite much literary attention. In consequence of this students are not well instructed, and instances of liver disease, when they do occur, receive less recognition and attention than their importance warrants. Functional disorders of the liver occurring in late childhood and early adolescence, however, we are told by Musser, are probably of much more frequent occurrence than we are led to believe from the text-books. Before taking up the subject of the various diseases separately, a few remarks as to the general symptomatology of affections of the liver are in order.

In a general way the symptoms of hepatic disease in childhood are the same as in the adult. Thus we have the phenomena pointing to general failure of health and strength; there is a loss of appetite, and other dyspeptic symptoms. The bowels are either constipated or irregularly loose. More or less jaundice usually accompanies the condition. In certain diseases of this class ascites is a prominent feature; enlargement of the spleen and of the veins of the abdomen is also occasionally seen; from the congestion affecting the lower bowel, hemorrhoids are frequently produced. In certain affections, particularly those accompanied by formation of pus in the liver, chills, fever, and sweats may occur. Various nervous disturbances, such as intense mental depression, amounting sometimes to an actual melancholia, are nearly always present. Pain is only present in certain acute diseases,

such as suppurative hepatitis, in acute congestion, and in syphilitic disease of the organ, especially where the capsule is involved. When present it will be localized or general, rather more generally the former. It is felt on the right side of the hepatic region, and may extend to the right shoulder. As a general rule, it is dull and heavy in character, although in certain forms of hepatitis it is sharp and cutting, very closely simulating that of right-sided pleurisy, or pleurodynia. However, we know that in pleurodynia we have immobility, the respirations and general movements are painful, the parts affected being tender when palpated or subjected to other methods of examination. As a general rule, also, there may be rheumatism in other parts of the body. In pleuritis the pain is distinctly increased during respiration, and is always associated with pleural friction sound. Besides this, a cough of characteristic type always attends the attack. Occasionally the symptoms of perihepatitis may so simulate those of pleurisy affecting the right side that it is almost impossible to tell them apart, but in pleurisy, sooner or later, fluid will be detected in the cavity of the pleura, while in hepatitis, of course, no such symptom will develop. It may also be distinctly paroxysmal as in hepatic colic, but this affection is found so rarely in young children that it can almost be left out of the question. Pain from liver disease is apt to be constant, and is most usually increased by movement or pressure. It is liable to extend upward along the lower edge of the organ or into the epigastrium. In hepatic abscess the pain is localized, and where the abscess has resulted from traumatism the position of pain corresponds to the point of injury. In disease accompanied by enlargement of the organ, sensations of heaviness and weight are sometimes experienced on the right side.

During the early years of life the liver, in proportion to the bodily weight, is much larger than in the adult. The upper border extends to the fifth, sixth, and seventh ribs in the midclavicular, axillary, and scapular lines respectively. The lower border can be outlined two inches below the margins of the ribs. The left lobe can be outlined with considerable ease, and extends in the median line to within an inch of the umbilicus.

In order to make a systematic examination of the organ the methods to be employed may be divided into inspection, palpation, and percussion.

Inspection.—

Palpation.—

Percussion.—

Inspection.—In inspecting the abdomen and thorax of a patient suffering from hepatic disease, little information can often be obtained, except in certain forms of disease. The abdomen may be somewhat distended, sometimes by flatulence and in certain affections by ascites. If much enlargement of the liver be present, the lower third of the right side of the thorax and the upper part of the right side of the abdomen may be distended, and the breathing correspondingly affected on that side. Especially is the latter the case if much pain is present. In abscess and hydatid disease tumors may be outlined in the left lobe and along the lower border of the right lobe. Occasionally, in abscess the skin above the affected area of the liver may assume a red color. Enlargement of the veins of the abdomen will very frequently be noticed, especially in certain diseases. The position assumed by the patient is of some value in diagnosis. When lying down, the patient will usually assume a posture on the right side, with legs drawn up; turning on the left side increases the amount of pain considerably. The breathing will often be shallow on account of the pain felt in prolonged inspiration. The presence or absence of jaundice should be noted.

Palpation.—The large size of the left lobe of the liver may sometimes be mistaken for a tumor, either on the surface of the liver or in the abdominal cavity. The latter may be diagnosticated by the fact that the liver will move during respiration, whereas a tumor would remain stationary. The normal outline and consistence of the liver may be changed in various forms of disease affecting it; thus, in amyloid disease a distinct induration of the surface and edge may be detected by palpation, and where fatty infiltration has taken place these parts will be found to be smooth and soft, while in cirrhosis they are sharp and hard. A characteristic fremitus will very often be detected in hydatid disease and a friction sound in perihepatitis. In palpating and in percussing the lower borders of the liver care should be taken to thoroughly empty the transverse colon previous to examination, as a quantity of feces contained in this part of the bowel will seriously interfere with the examination.

Percussion.—In the practice of this method of diagnosis it should be remembered that in order to outline the upper borders of the liver deep percussion must be employed, while it is best to use light percussion in defining the lower border. By means of percussion

variations in the size of the liver may be detected. An irregular enlargement of the organ may point to a hepatic abscess or hydatid disease. In both of these the increase in dulness is over the convexity, if this part of the organ is affected, the area running upward and to the right; where the center of the organ is affected, the line of dulness is downward. Where the left lobe is enlarged, an increase in size of this portion can be quite distinctly outlined. Where fluid is present, the area of dulness may be made to change by turning the patient on the left side. A tumor of the right kidney may in some cases give the sensation of being attached to the liver or may simulate enlargement of that organ, but a line of tympanites or a lighter note will be detected, and the finger will slip between the lower borders of the liver and the tumor; and where doubt as to the diagnosis exists, the history of the patient and an examination of the urine will generally settle the question. Exploration of the liver can also be aided by aspiration with a hypodermic syringe. By this method specimens of pus, serum, or hydatid fluid may be drawn off and examined. Pus from an abscess in the liver will contain principally leucin and tyrosin, and possibly the characteristic liver cells. Where the fluid is reddish-brown and mixed with blood, and especially where the *Amœbæ dysentericæ* are found in it, the abscess is secondary to dysentery. Where serum is drawn by the hypodermic needle, we may conclude that it comes from the pleural cavity and not from the liver, as the latter does not yield serous fluid. The fluid from a hydatid is of low specific gravity, alkaline in reaction, and clear. It contains small quantities of albumin, sugar, and a considerable amount of sodium chlorid. Succinic acid may also be found. The echinococcus membrane, hooklets, and other traces of the parasitic cause of the disease will be found on the microscopic examination.

JAUNDICE OCCURRING DURING CHILDHOOD.

Jaundice may occur at any time in childhood, although the period immediately following birth is the one in which it is most frequently seen. The symptoms are usually of gradual onset, being those of a more or less severe gastric or intestinal catarrh, either of acute or subacute origin. The liver is found to be enlarged upon percussion, its outline extending below the normal line for an inch or

two. There is generally, also, some tenderness in the epigastrium and right hypochondriac region. With these symptoms there is also the typical coloring of the skin, which may vary from a yellow to a brownish-yellow or almost greenish tint. The ocular conjunctiva, and even the mucous membranes of the body, may share in the general discoloration. Occasionally, a slight rise of temperature accompanies these symptoms. An itching of the skin, which may be quite distressing, is frequently felt. The *cause* is generally improper feeding, excesses in diet, or taking cold. The *diagnosis* is easy: the discoloration of the skin, the slight pyrexia, the history of indiscretions in diet, or chilling of the extremities should materially aid in distinguishing the condition. The prognosis is good.

Treatment.—If the attack of jaundice is severe, particularly if fever accompanies, the patient should be kept in bed for a few days. Mild counterirritation may be made over the epigastrium by means of rubbing the parts with some stimulating liniment or by the application of a mustard or spice bath. Massage is of considerable use, particularly where manipulations can be made over the gall-bladder. Faradic electricity has also been advised. The diet is a matter of very great importance. No foods containing starch or sugar should be employed; the patient should be kept upon a diet of milk, diluted and made alkaline by lime-water or some alkaline mineral water. Musser advises that this milk be taken hot. Animal broths, particularly mutton broth, thin chicken broth, or beef tea should be the principal food employed. Foods containing fat should not be given the patient. Where the digestion is weak, particularly if the patient is inclined to vomit, oyster or clam broth or koumiss may be used with advantage. As the patient improves, he may be given small quantities of fresh fish or eggs and the white meat of chicken. The medicinal treatment is of considerable importance in jaundice. If seen early, very frequently a brisk laxative of calomel, combined with phosphate of soda, may be given two or three times in the twenty-four hours, this being followed by a moderate dose, say a dram, of castor oil. The combination of calomel and bismuth has also been found to be of use. The following formula has been recommended by Musser:

R. Liquor potassii citratis, f ʒ ij
Tinct. opii camph., f ʒ j.

SIG.—Half to one teaspoonful every two or three hours.

This formula is particularly useful where there is considerable pain. Where vomiting is the prominent symptom, minute doses of hydrochlorate of cocain are of value. The treatment of the intestinal catarrh from which this condition frequently arises has already been dealt with at length, and will not be repeated; nevertheless, there are a few special symptoms the treatment of which should require attention. Among the most prominent of these may be mentioned flatulence with painful digestion. In the treatment of this condition the diet should be such as will be quickly assimilated with the formation of as little gas as possible. For the medicinal treatment, extract of pancreatin in combination with an alkali, and given an hour or so after meals, is the most valuable agent. Naphthalene, salol, thymol, creosote, and particularly charcoal, may all be used with good effect in certain cases. As a combination of the two last-named agents, Musser recommends the following:

R. Creosolum, gr. $\frac{1}{4}$
 Carbo. lig., gr. j
 Pancreatin., gr j
 Bismuth. subnitras, gr. iij.
 Ft. chart. No. i.
 Sig.—Take after meals.

To relieve the distressing itching of the skin, which is sometimes so severe as to cause almost continual scratching, a sponging of the surface with ten drops of carbolic acid to a pint of water, or with a hot solution of borax or bicarbonate of soda, will be found very useful. If this fails, Goodhart recommends that from $\frac{1}{24}$ to $\frac{1}{32}$ of a grain of pilocarpin should be injected hypodermically. For the cerebral symptoms in severe cases, effort should be made to hasten as quickly as possible the elimination of bile, at the same time using all means possible to support the patient. For this purpose the salts of ammonia, particularly the chlorid, should be given in doses of from one to five grs., and administered in the syrup of orange or syrup of licorice, or, better, a little glycerin. Phosphate of soda is also probably one of the most valuable drugs that can be employed to hasten the elimination of bile. Caffein has also been extensively used, and pilocarpin is a valuable agent in aiding diaphoresis. Where a sub-normal temperature occurs, and especially where this is accompanied by considerable prostration, the patient should be fed on a

nutritious, highly concentrated diet of proteid foods, and stimulation aided by moderate doses of alcohol. Where hemorrhages occur, sulphuric acid or the acetate of lead are useful as astringents. Turpentine and ergot have also been used for this purpose. Where the blood is more than usually depleted by the disease, the use of oxygen has been recommended. As the patient improves, he may be gradually returned to a more varied diet, although for a long time fatty, saccharine, or starchy foods must be used with great caution. As an aid to digestion, and also to stimulate hepatic action, probably one of the most useful medicinal agents is hydrochloric or nitrohydrochloric acid. These may be given internally in doses of one to two drops, combined with some bitter tonic. Local applications of the diluted acid applied in the form of a wet pack over the hepatic region have been used with very good results. Another method which has been recommended by Musser, and which was invented by Krull, is the injection of from two to four pints of water into the colon three times a day. The temperature of the water is raised with each injection; at the first a temperature of 59° F. (15° C.) is used, and the other two enemata are made warmer until the temperature of 72° F. (22.2° C.) is reached.

CONGESTION OF THE LIVER.

Two forms of hepatic congestion are described, namely, the active and passive. The former is produced by an exaggeration of the normal congestion of the organ which is produced by the stimulus of food. The causes of this increase in blood-supply are generally overeating, the food being either too rich in quality, or of a too great quantity; an abuse of stimulants may also produce the condition, but this is rare in childhood.

Symptoms.—Some pain is experienced in the region of the liver, and the organ will be found to be enlarged and tender on palpation. The increase in size will be uniform, sometimes extending for a distance of one or two inches beyond its normal boundaries. The edges and surfaces are smooth, no nodules being felt. Where the gall-bladder is enlarged it is possible to outline it in the right hypochondriac region to the left of the midclavicular line, in a line drawn from the acromion process of the right scapula to the umbilicus (Musser). The

amount of jaundice is usually slight. The passive form of congestion, in almost every case, occurs as a secondary consequence to diseases of the heart or lungs. The liver becomes engorged with blood, this condition being due to the deficient action of the lungs or heart. Chronic malarial poisoning is also given as a cause. The increase in size is slow, constant, and uniform. According to Musser, the edge of the liver is sharper than in the active variety of congestion and is more indurated. "In the right midclavicular line the lower border may extend to the level of the umbilicus and in the median line the left lobe may extend for three-fourths of that distance." Where there is effusion in the right pleura, the upper border can not so easily be made out. The constitutional symptoms are those of gastro-intestinal catarrh; there is loss of appetite, some nausea and vomiting, constipation, and intestinal dyspepsia. The tongue is covered with a brownish coat; the amount of jaundice is usually slight. In the passive form, we have in addition the constitutional symptoms, referable to the heart, lungs, or kidneys, diseases which are the most frequent cause of the condition. The urine is apt to be albuminous and contains considerable quantities of bile-pigments. A moderate amount of mental depression very frequently accompanies the disease.

The **prognosis** of the acute form of congestion is favorable. In the passive variety the prognosis will be influenced by the extent and progress of the disease causing the congestion.

Treatment.—The main objects to be accomplished in treatment are the removal of the cause of the congestion, and the relief of the engorged liver by the judicious use of purgatives. The patient should be put on a low diet, and all starchy, saccharine, and fatty foods excluded. The sufferers may be fed on animal broths, or small quantities of meat and such other foods as are digested chiefly in the stomach. Purgatives are of great use, particularly those which act directly on the liver. The two most useful of this class of agents are calomel and phosphate of soda. These may be given either alone or in combination. When combined they are best administered in the form of a powder, capsule, or combined with the *mistura glycyrrhiza*. Phosphate of soda is best administered in hot water at bed time, or in the morning, or in soup or broth. Chlorid of ammonium, in doses of from three to five grains, has been greatly praised. It should be given in the above quantity every two or three hours. *Ipecacuanha*

has also been used with great benefit. It, however, sometimes produces such an amount of nausea and depression as to reduce its favorable action. According to some authorities it should be given in doses as large as five grains, twice in the twenty-four hours, to children under five years of age. A few drops of deodorized tincture of opium or a sinapism over the epigastrium are used to prevent the intense nausea. After the acute symptoms have subsided, dilute nitric acid or nitrohydrochloric acid may be given in doses of from two to ten drops three or four times a day, or local applications in the form of packs, consisting of cloths wet with diluted nitric acid, may be applied over the region of the liver. The dyspeptic symptoms should be treated by the use of bitter tonics, and continued small doses of calomel, bismuth, or phosphate of soda. Small doses of silver nitrate may also be used with benefit. The passive form is best relieved by treating the condition causing it.

PHYSICAL SIGNS OF ACUTE HEPATIC ABSCESS.

The liver is irregularly enlarged, the increase in size being sometimes in an upward direction only, generally, however, the lower border of the viscus is extended downward. Some prominence of the diseased lobe may be felt in the right hypochondriac or epigastric region. Pain will be experienced on palpation over the affected area.

MULTIPLE HEPATIC ABSCESS.

The symptoms of this form of hepatic inflammation are frequently only those of the disease causing it. The condition, as has been before stated, arises usually from infection somewhere in the portal area; thus, according to Musser, injuries or disease of other abdominal viscera will produce it. Appendicitis is a very frequent cause. The symptoms arising from a diseased condition of any other abdominal organ will precede those of hepatic inflammation, and following these the symptoms of multiple hepatic abscess are usually the following: Jaundice suddenly appears, or, where this is not very marked, the skin assumes an unhealthy sallow hue. The liver becomes enlarged and painful, this pain being of a heavy, dragging character; the fever assumes an intermittent type, and there are daily rigors. In some

cases the fever somewhat resembles typhoid. The tongue becomes dry and covered with a brownish coat. There are sordes on the teeth and lips. Nausea and vomiting are present and are accompanied by diarrhea, the stools being light-colored and offensive. The urine rapidly diminishes in quantity, is highly colored, and contains much bile-pigment. Albumin is present. A microscopic examination will demonstrate the presence of blood and granular and epithelial casts. The nervous system soon becomes involved, delirium of a low muttering type appearing. Subsultus is present. Later, the patient may have convulsions or may pass into a state of coma. Death may occur from exhaustion, or in some cases the kidneys become so involved that nephritis may produce a fatal termination.

Diagnosis.—In acute single hepatic abscess resulting from traumatism, the diagnosis can be made by the history of injury, the irregular enlargement of the liver and the symptoms pointing to supuration. In doubtful cases the exploratory needle may be inserted under strict antiseptic precaution to aid in the diagnosis.

Where multiple abscesses exist, the symptoms of hepatic abscess following in the train of the evidences of disease in some other abdominal viscus should lead us to suspect the presence of this form of hepatic inflammation.

Prognosis.—Where the abscess is single and can be opened externally, a favorable termination of the case is possible. The prognosis of multiple abscess is very grave.

Treatment.—The treatment should be by surgical methods. According to the best authorities, where the number of abscesses does not exceed three, free incision should be made. Where the abscess is situated along the margin of the ribs or is in the epigastric region, the operation is simple. When situated in the convexity of the right lobe, Musser advises that it should be opened through the pleural cavity, and in this case excision of the ribs is necessary. The abscess cavity should be drained and irrigated, and a drainage-tube inserted.

SYPHILITIC INFLAMMATION OF THE LIVER.

The liver may undergo changes due to the effect of general syphilitic infection. According to Musser, two forms are generally seen. In one the inflammation is chiefly confined to the capsule of the organ,

and in the second the connective tissue of Glisson's capsule is the seat of the organic change. The liver may be large and painful, or, where shrinking of the connective tissue occurs, the organ may diminish in size.

Symptoms.—Other manifestations of syphilis, such as coryza, cutaneous eruptions, inflammation of the mucous membranes, the peculiar cranial formation, and, in fact, any of the sequence of symptoms of specific disease will be present. There may be some fever, the temperature rising to 100° or 101° F., accompanied by a corresponding rise in the pulse-rate. There may be pain on respiration. Marked tenderness will be found on palpation and percussion over the liver. A moderate amount of jaundice is generally seen. When contraction is occurring, the list of symptoms will embrace in addition those of portal obstruction.

Diagnosis.—This will be made from the direct association of the changes in the liver with other symptoms of syphilis.

The treatment is that of general syphilis.

SUPPURATIVE INFLAMMATION OF THE LIVER.

Synonym.—SUPPURATIVE HEPATITIS.

The suppuration may arise from one or more abscesses. The most frequent cause is a blow or fall wherein the liver is injured. When arising from this source, the abscess is usually single. Multiple hepatic abscesses most commonly arise from infection or suppuration in the portal system.

Symptoms.—These may differ widely in the two forms. In the traumatic form there is a very considerable amount of pain in the hepatic region, accompanied by symptoms of perihepatitis. The parts about the seat of injury are swollen and discolored, and general evidences of traumatism will frequently be seen. The symptoms pointing to suppuration may follow almost immediately after those due to direct injuries, or in some cases they will appear several days after the entire subsidence of all external evidences of the injury. The symptoms of the formation of an abscess are pain over the liver, this being a prominent symptom, and generally a severe one. There is irregular enlargement of the viscus; fever is present, and may either be of a remittent or intermittent type. The rise of temperature is pre-

ceded or followed by rigors and exhaustive sweats, the patient rapidly loses flesh, the appetite fails, nausea and vomiting are present, and in many cases diarrhea soon makes its appearance. Respiration becomes difficult and painful, both inspiration and expiration being affected. The pain is generally greatest in the sixth or seventh right interspace in front, or in the seventh or eighth interspace behind, where the seat of the inflammation is on the convex surface of the liver.

INTERSTITIAL HEPATITIS.

Synonyms.—CIRRHOSIS OF THE LIVER; HOBNAIL LIVER, GIN-DRINKER'S LIVER, SCLEROSIS OF THE LIVER.

Interstitial hepatitis is an inflammation of the true connective tissue of the liver, this being followed by contraction and hardening of the organ and an atrophy of its secreting cells. The principal characteristics of the condition are gastro-intestinal catarrh, slight jaundice, ascites, and gradual failure of bodily weight and general health. Interstitial hepatitis exists in infancy and childhood in two forms, the atrophic and hypertrophic. The former is the more common, the latter being extremely rare.

Causes.—The most common causes are syphilis or alcoholism, the latter in childhood being most frequently produced by the too constant administration of this drug for any purpose during the early period of life. Chronic heart disease, infectious fevers, tuberculosis, and rachitis may all be etiologic factors. According to Howard and others, ptomainic and other poisons arising from imperfect digestion may produce the condition. Atrophic cirrhosis is the most common form in childhood, the hypertrophic form being rarely seen except congenitally. Interstitial hepatitis is said to occur more frequently in males than in females, and although it may appear at any period of childhood—the largest number of cases occur from the ninth to the nineteenth year.

Symptoms.—In the beginning the symptoms are very apt to be confounded with those of ordinary hepatic congestion, arising from disturbances of the digestive tract. There is nausea and vomiting or attempts to vomit, these occurring particularly in the morning. The vomited matter consists largely of mucus. The bowels are irregular, being sometimes constipated and sometimes having attacks

of diarrhea. The stools contain considerable mucus. Hemorrhages may take place from the nose, mouth, esophagus, stomach, or intestines, and purpuric spots are occasionally seen in different parts of the body. Dilatation of the subcutaneous abdominal veins very frequently occurs. The face is pale or of a sallow hue, and numerous stigmata composed of groups of minute veins are seen upon it. There is a slight amount of jaundice. This may be constant, although the attacks are very apt to recur. A moderate amount of ascites is almost invariably seen, and not infrequently this may be one of the prominent symptoms of the disease. From obstruction to the portal system there is dilatation of the veins, large and small, particularly the superficial veins of the thorax or abdomen. Not infrequently a well-defined arch is seen extending across the chest, marking the attachment of the diaphragm. The superficial abdominal veins are also in many cases fairly outlined. Enlargement of the spleen frequently occurs. The temperature in the early stages is moderately elevated, a rise of two or three degrees being usual (101° to 102° F.). This is most commonly observed in the evening. As the disease progresses, however, a subnormal temperature is the most common. The urine is of high specific gravity and contains large quantities of uric acid and urates. If nephritis develops, which it very frequently does during the course of the disease, the urine will become albuminous and will be found on microscopic examination to contain granular and hyaline casts. Traces of sugar will sometimes be seen. During the first stage the liver enlarges, but later steadily diminishes in size, this decrease being particularly noticeable in the left lobe. While dropsy usually seen in this disease is abdominal, yet in a certain number of cases swelling of the lower extremities may take place. In the late stages of the disease the mind becomes clouded, largely from retention of the various products of excretion, the patient becoming first dull, and later passing into coma or active delirium. Convulsions may occur.

Pathology.—In the *first stage* there is hyperemia of the connective tissue of the liver, followed by the development of the connective-tissue elements, causing an increase in size and density of the organ. From this hypertrophy of the connective tissue pressure is made upon the true hepatic cells, causing them to undergo fatty degeneration. In the *second stage* the imperfectly developed connec-

tive tissue contracts, causing the organ to decrease in size, and producing induration. Its surfaces become nodulated, thus giving the liver the appearance which is usually characterized by the term "hob-nail." Obstruction to the portal and hepatic circulations soon occurs.

The **diagnosis** is to be based upon the physical signs, the symptoms of portal obstruction, and the characteristic appearance of the face. The diseases with which cirrhosis is most likely to be confounded, are, firstly, atrophy of the liver; but cirrhosis most commonly follows obstructive diseases of the heart or lungs, no nodulation of the organ occurs, and the history of alcoholism or syphilis is generally wanting. Secondly, tubercular peritonitis. In this disease the abdominal tenderness is general; there is rapidly developing ascites, absence of jaundice, and, in the majority of cases, the symptoms of gastro-intestinal dyspepsia are absent. The liver on percussion will be found to be normal. There are, also, as a general rule, evidences of tuberculosis in other organs of the body. Cancer of the peritoneum may have some symptoms resembling those of perihepatitis, but this disease occurs very rarely in childhood. The liver will be found normal upon examination, and there will be other symptoms characteristic of cancerous disease.

The **prognosis** is very unfavorable.

Treatment.—The indications for treatment are, first, to remove the causes; second, to prevent, so far as possible, the increase of connective-tissue growth, and to relieve the engorgement of the hepatic and portal circulation. Third, if the case is too far advanced for cure, we must then endeavor to relieve the symptoms as they arise. In order to meet the first indication, the causes of irritation must be removed. The patient should be allowed no alcohol in any form; all highly-seasoned, fatty, or saccharine foods must be given up, and even articles of food containing starch must be used with great caution. The diet should consist principally of the lighter meats, such as the white meat of chicken or turkey, although other animal diet may be employed in moderation. To better insure its digestion, it is well to have the meat finely chopped, and made into the form of a meat ball, without fat, and carefully browned. As a continuous animal diet may tend to cause scorbutus, doses of lemon juice or diluted citric acid must be administered occasionally to counteract this tendency. Eggs may also be employed as an article of diet.

Probably the best food for these cases is milk,—either the best dairy milk, skimmed, or buttermilk may be used,—or in some cases where the patient tires of this article of food, which is generally the case in a short time, it may be administered in the form of various desserts, such as junket, blanc mange, or light puddings. The tendency to constipation must be corrected by the administration of alkaline aperient waters, such as Hunyadi, Saratoga, or Carlsbad. Vegetables such as spinach, lettuce, or those containing little or no starch, may be allowed, but potatoes, rice, and other vegetables containing starch should be used sparingly, if at all. The question of dress is of some importance. The patient should wear flannel next to the skin the year round, and should dress warmly enough to avoid chilling. An outdoor life in the open air is best for these cases. The medicinal treatment should be directed toward the relief of the engorgement, and the prevention of the increase of the pathologic conditions causing it. The application of cups and leeches, which has been practiced by some, is not now recommended by best authorities, although counterirritation over the liver by the use of some stimulating liniment may probably be of some slight use. The benefit derived by having the patient drink freely of hot water, say a glassful half an hour before eating, each draft to contain from two to five grains of sodium phosphate, is very considerable. The saline cathartics or laxative mineral waters are exceedingly beneficial. The patient should have from three to six liquid movements a day. To prevent the increase of connective tissue in the organ many drugs have been recommended. One of the most highly lauded is chlorid of ammonia. This should be given in doses of from two to five grs. every four or five hours. It is best administered in some syrup or elixir. Probably one of the most useful agents which has stood the test of time is phosphate of soda; this should be given in doses of from five to ten grs. according to the age of the child. It is best administered in hot water, and may sometimes be disguised in soup, being used in the place of salt. Potassium iodid is said to retard the changes in the organ when given in the early stages. In cases of syphilitic origin, this drug, of course, will have a particular usefulness. Small and continued doses of mercury, in the form of calomel, bichlorid, or gray powder, are valuable agents. In advanced cases, where the principal indication is the relief of the various distressing symptoms of the disease, these should be treated as they arise.

Where ascites is marked, the patient should be placed on a dry diet, principally of meat. The gastro-intestinal dyspepsia which always accompanies the malady should be treated as in other cases. Hemorrhage from the stomach or other part of the digestive tract requires rest in bed, the administration of cracked ice, and the application of an ice-bag externally. Where the hemorrhage is of gastric origin, food should be administered by rectum. Opium should always be given to quiet the patient, and may be used in either the form of morphin hypodermically or paregoric in suitable doses, administered alone or in combination with an astringent such as sulphuric acid. The following formula, recommended by Musser, is useful in these cases :

R. Tinct. opii camph.,
Acid. sulphuric. aromat., aa f̄ssj.
Sig.—Eight to ten drops in water every two, three, or four hours.

Various astringents, such as acetate of lead, bismuth, nitrate of silver, and many others, have been employed. Hamamelis, in doses of twenty drops every hour or two, has been employed with benefit. The various preparations of iron, particularly Monsel's salt, given in the form of a hard pill, of one grain, is of use in intestinal hemorrhage. In cases of hemorrhage from the lower bowel, astringent enemata should be employed. Ascites should be treated by the administration of diuretics and saline cathartics. Drafts of cream of tartar dissolved in water are valuable for this purpose, and are rather pleasant to the patient. Infusion of scoparius has also given good results in these cases, but probably the best of all drugs for this purpose is calomel. This may be used alone, or in combination with a compound jalap powder. Copaiba gives a more permanent result. Where the child is old enough to take the drug in this form, it may be administered in the capsule containing three minims. to be taken every four hours. Where the heart is weak, caffein or digitalis should be employed, and hydrochlorate of cocain is also said to have given good results for this purpose. As in the late stages of the disease death frequently takes place from exhaustion, stimulants and cardiac tonics should be used where this condition is threatened. Paracentesis may be employed frequently. The jaundice requires no special treatment.

FATTY LIVER.

The so-called fatty liver consists in a uniform enlargement of the organ due to its becoming infiltrated with fatty elements. As a rule, there is no actual degeneration of the true hepatic structure. It is an intercurrent affection, being associated with gastro-intestinal catarrh, tuberculosis, or other wasting disease. The excessive use of saccharine or starchy food, particularly where associated with a sedentary life during childhood, is also an etiologic factor.

Symptoms.—There is a uniform enlargement of the liver, its surface is smooth, and palpation causes no pain. The surfaces of the organ are smooth and soft, and its edges rounded. The general symptoms are negative.

The **treatment** should consist in strict attention to the hygiene and diet. Foods containing large quantities of carbohydrates must be excluded. The patient should take plenty of outdoor exercise, or, where this is impossible, should receive massage. A large part of the treatment consists really in treating the disease from which the fatty infiltration arises.

AMYLOID DISEASE OF THE LIVER.

Synonyms.—LARDACEOUS LIVER; WAXY LIVER; SCROFULOUS LIVER; ALBUMINOUS LIVER.

Amyloid disease consists in a degeneration of the liver structure, caused by deposits of an albuminoid material, the microscopic appearance of which resembles starch granules. The disease may appear at any age of childhood, and in the majority of cases occurs in the course of suppurative diseases, particularly those of a chronic nature, such as tuberculosis, especially tuberculous bone affections, syphilis, and rachitis. It is frequently associated with amyloid disease in other organs.

Pathology.—The liver presents a pale, glistening, anemic appearance, and has a doughy consistency. There is a uniform enlargement of the organ. There are certain chemic tests whereby the presence of amyloid degeneration can be easily ascertained. One of these is made by first cleansing the surface of the organ and then brushing over it an aqueous solution of iodine with iodide of potassium. When-

ever the deposits of amyloid substance have taken place these will assume a brownish or mahogany color, which in turn will change to violet or a bluish tint if diluted sulphuric acid be added. Another test consists in brushing the liver over with a solution of anilin violet of the strength of one per cent. This will produce a red or pinkish color on coming in contact with the amyloid deposits, the unaltered tissues being stained blue.

Symptoms.—Anemia is usually the most prominent symptom. There may be some prominence of the external abdominal veins. Where jaundice is present it is slight, but in the majority of cases it does not appear. Diarrhea is generally a prominent symptom, and hemorrhage from the bowels may occur. Dyspepsia is common. Where the kidneys share in the amyloid degeneration, dropsy in various parts of the body may occur. In these cases the urine will be increased in amount and will contain albumin. Palpation will show that the liver is greatly increased in size, sometimes attaining two or three times its normal dimensions (Musser). This enlargement is uniform. The edges of the organ will be found to be round and hard, and palpation, as a rule, does not give pain. Enlargement of the spleen is generally a coincident symptom.

Diagnosis.—Amyloid disease may be suspected in any case where increase in the size of the abdomen occurs in the course of a chronic suppurative disease. In suspected cases examination of the kidneys and spleen should be made, and where these are found to share in the amyloid degeneration, diagnosis is positive. Intended surgical operations on the bones and joints should not be attempted during the course of this disease.

The **prognosis** is unfavorable; although the affection may proceed either rapidly or slowly, the termination is always fatal.

Treatment.—Outside of the fact that all effort possible should be made to bring the patient's system into as good a condition as possible by the use of tonics and the best hygienic surroundings, the treatment is largely symptomatic. Various drugs have been recommended, particularly chlorid of ammonia and syrup of the iodid of iron. Iodin has also its advocates, but in the majority of cases dependence upon any of these agents will be found to be disappointing. Efforts should be made to remove the cause as quickly as possible, especially where this arises from any suppurating disease of the

bones. In cases where congestion of the hepatic or portal circulations due to cardiac weakness occurs, such drugs as digitalis, strophanthus, or other heart tonics will be found of service.

ACUTE YELLOW ATROPHY OF THE LIVER.

Yellow atrophy is very rare in childhood. At this period of life the etiologic factors are usually syphilis, or poisoning from phosphorus. The disease is also known by the names of general parenchymatous hepatitis and malignant jaundice.

Pathology.—At first there is hyperemia of the hepatic cells, with a grayish exudation between the lobules; following this the cells undergo fatty degeneration. A marked reduction in the size and weight of the organ occurs. The spleen is enlarged, and degeneration of the kidneys takes place. The urine contains bile-pigments and albumin, and generally crystals of lucin and tyrosin will also be found in it. The disease is of insidious onset; there are symptoms of general malaise, accompanied by icterus. In the beginning there is a slight elevation of temperature, some pain over the epigastrium, headache, nausea, vomiting, and a coated tongue. As the disease progresses the headache becomes worse,—indeed, is generally a prominent symptom,—the pulse becomes slow, and the jaundice intense. Later, the patient shows all the symptoms of profound toxemia. There may be fever or occasionally a subnormal temperature. The stools are black and tarry, and vomiting of black, grumous substance, the so-called coffee-grounds vomit, may occur. In the last stages the patient becomes comatose, or may die in convulsions.

The **treatment** is chiefly symptomatic; efforts should be made to relieve the toxemia by hot packs, hot drinks, and the administration of calomel or other agents that will act on the liver. Diuresis should be encouraged. Small doses of phosphorus have been recommended, but have so far proved of no avail.

HYDATID DISEASE.

Although hydatid disease is a rare affection, it is occasionally seen in children. The methods of infection are the same as in the adult. The first symptom noticed is generally enlargement of the abdomen,

the tumor being greatest in size in the region of the liver. This enlargement of the hepatic region may be general, although usually the greatest amount of swelling corresponds to the position of the cyst. If this be situated on the convex side of the liver, percussion will demonstrate that the normal area of dulness extends higher in the axillary region in front and in the scapular regions behind. If the cyst is situated in the right lobe, dulness will be found to extend downward toward the umbilicus, and when in the left lobe, examination will reveal the presence of the greatest amount of swelling in the epigastric region. The tumor is usually painless, and percussion over it will cause little or no discomfort. Fluctuation may be found, and occasionally the symptom known as hydatid fremitus may be detected by placing one hand over the tumor and forcibly and quickly tapping another part of the tumor with the other hand. There is generally little or no deterioration in the general health so long as the cyst remains unruptured or there is no great pressure upon the hepatic duct. Jaundice is either slight, or where it does appear it develops slowly. Rupture of the cyst is generally followed by symptoms of pyemia, and whenever in the course of development of a hydatid cyst periodic elevations of temperature arise, these being preceded by rigors and followed by sweats and general prostration, rupture of the cyst can generally be diagnosticated. This rupture may take place into the hepatic duct, or, in some cases, into the surrounding organs, such as the pleura, colon, bronchi, or even into the pericardium or vena cava.

The **diagnosis** is principally made from the character of the enlargement of the liver. An irregular increase in size, the presence of fluctuation, the absence of pain on palpation, and the continuance of a fairly good condition of general health serve as diagnostic points. From hepatic syphilis hydatid disease must be distinguished by the fact that in the former the enlargement, although present, is irregular, the liver is harder, and some of the general symptoms of specific disease will be present. The diagnosis between hydatid cysts and abscess of the liver is often one of extreme difficulty. In abscess there is usually a history of traumatism; there is pain and tenderness over the liver and the general symptoms are more rapid in their onset. Hydro-nephrosis may in some cases be mistaken for hydatid disease, but the former is very rare in children. When doubt exists, an exploratory puncture will aid in diagnosis. Affections of the pleura may be in

some cases confounded with hydatid disease, and the diagnosis may be rendered particularly difficult where a cyst has ruptured into the right pleural cavity. In the latter case probably the only point of differentiation will be the presence of the hooklets of the echinococcus in the sputum.

The **prognosis** is variable. A fair number of cases will probably go for years with one or more of these cysts gradually developing in the liver. Indeed, cases have been reported in which spontaneous cure has occurred. When the cyst is in such position that it can be attacked by operative measures, its removal is recommended by most authorities.

Treatment.—It is generally considered that the best results in treatment are obtained by surgical means. The abdomen should be opened at the most prominent part of the tumor, and the cyst evacuated. If any small cysts exist, they should be carefully emptied at the same time and a thorough irrigation of the abdominal cavity should be practised. It is generally recommended that the drainage-tube be left in the incision. Great care must be taken to remove every part of the cyst, as suppuration will take place if any portion of the original cyst or daughter cysts is allowed to remain. Where the cyst is situated in the upper surface of the liver, it is sometimes necessary to open it through the diaphragm; in this case one or two ribs must be resected and the pleura stitched to the diaphragm.

Electricity and injections into the cyst have been tried, but have not met with much success. In cases where for any reason laparotomy can not be done, it has been advised by some that the cyst be opened by means of a large trocar and cannula, and a drainage-tube inserted through the latter. Simon's method consists in passing needles into the tumor so as to cause an adhesive inflammation, and then later to practise incision. Aspiration has also been followed by temporary success and has been recommended by Dieulafoy and Murchison. Even after operative treatment recurrence may take place, even as late as two or three years after incision, as in two cases reported by Morris. Biliary fistula is also one of the secondary dangers of operative treatment, and cases of this have been recorded.

CHAPTER X.

DISEASES OF THE GENITO-URINARY SYSTEM.

ADHERENT PREPUCE AND PHIMOSIS.

Adhesions between the prepuce and the glans penis are not infrequent at birth. They may appear in congenital forms, or may be acquired. If the latter, they are usually caused by an irritation set up by the collection of smegma accumulating under a long, tight foreskin. Phimosis is that condition by which the foreskin is prevented from being drawn back over the glans by an abnormal smallness of the opening of the prepuce. Both adherent prepuce and phimosis of a not very marked degree are seen in a large number of children, and both conditions very frequently disappear shortly after birth. They may, however, give rise to quite a variety of very distressing **symptoms** and **sequelæ**. Thus we may have great pain on urination which will cause the infant to cry vehemently, and in many of these cases it will be seen that the foreskin will balloon during the act of urination, the stream of urine being very small, or in some cases simply dropping away. A certain amount of urine is generally retained and will increase the irritation—in fact, may set up an actual balanitis. Various nervous phenomena, such as convulsions, may accompany the condition. In infants and older children the symptoms may be very varied. Choreic movements, nocturnal incontinence of urine, convulsions, persistent spasm of certain sets of muscles may be produced, and a chronic state of malnutrition often follows this condition. Adherent prepuce and phimosis are undoubtedly among the most common causes of masturbation in young boys.

The **treatment** should consist in breaking up the adhesions by passing the end of a blunt probe between the mucous membrane and the glans and dilating the preputial orifice with the blades of a pair of surgical dressing forceps. After this is done the prepuce should be

drawn back so as to expose the glans, which should then be cleansed and anointed with vaselin or any bland antiseptic ointment, after which the prepuce should be brought forward again. This should be done gently and repeated every second or third day until accomplished. It should be borne in mind that where the foreskin is kept back too long there is some danger of producing the condition known as paraphimosis. Where dilatation does not produce relief after several repetitions, the foreskin may be slit up as far as the corona glandis, along the dorsum, and the edges trimmed off with a pair of scissors. The mucous membrane may be stitched to the skin with fine silk or fine catgut. If this does not give relief, the regular operation of circumcision should be performed.

PARAPHIMOSIS.

Paraphimosis is a condition in which the prepuce has been drawn back over the corona glandis, and by reason of an abnormally small preputial orifice, or an increased size of the glans, can not be returned to its proper position. Following the retraction of the prepuce there is usually swelling of the glans and considerable edema. It may occur from a variety of causes. It may be congenital, although this form is rare.

The **treatment** consists in endeavoring to reduce the paraphimosis as quickly as possible by pressing the glans with the thumb and finger of one hand, while with the other hand an effort is made to draw the foreskin forward over the corona. Where this fails, it may be necessary in some cases to make a series of small punctures of the edematous mucous membrane, after which the same manipulation should be repeated. If the second method is not successful, the patient should be etherized, and the end of a blunt-pointed bistoury introduced under the edge of the prepuce which forms the constricting ring, and severing it on the dorsum of the glans. It may be necessary to divide the ring at more than one point. In many of these cases circumcision should be performed.

BALANITIS.

This condition is occasionally met with in children and is frequently the result of neglected phimosis. Very considerable swelling of the

prepuce occurs, accompanied by discharge often of large quantities of pus, producing great pain and scalding on micturition.

The **treatment** should consist in syringing the cavity beneath the prepuce with a warm bland antiseptic solution. It is generally recommended that circumcision be performed later.

VULVOVAGINITIS.

Vulvovaginitis in children is usually found in two forms, the catarrhal and gonorrheal. The catarrhal form arises from irritation which is produced by a variety of causes. In very young children it may be brought about by the continued use of diapers soiled with discharges, or from general lack of cleanliness. Seat-worms are a very common cause. It may also be due to traumatism and attempts at rape. A form of vulvovaginitis, known as the aphthous variety, is found in generally ill-nourished and unhealthy children, or may occur as a sequela of one of the continued fevers, or any constitutional disease, as nephritis, tuberculosis, etc.

In girls, at the age of puberty, it sometimes arises from retention of the menstrual secretion by an imperforate hymen.

The **symptoms** are those found in other forms of catarrhal inflammation. There is generally discomfort, some swelling of the parts, a burning pain on micturition, and a local rise of temperature. The secretion is at first arrested, the parts becoming dry, but later it is considerably increased. The patient complains, as a rule, of continual smarting and burning. There may be in the early stages some general rise of temperature.

In the *gonorrheal form* the symptoms are the same as in the previous variety, except that they are more intense. The discharge is free, and consists of thick greenish-yellow pus, in which gonococcus can frequently be found. The parts are excoriated, and generally very painful. Some swelling of the inguinal glands may occur. It is by no means uncommon in children, as in adults, to find the urethra involved in the general irritation.

The **prognosis** in both forms of vulvovaginitis is good. However, it must be borne in mind that in the gonorrheal form the infection may spread into the urethra and bladder, producing inflammation of these parts.

The **treatment** consists of absolute cleanliness. The parts should be bathed in warm water and Castile soap, after which they may be dusted with a powder consisting of calomel and starch, bismuth and starch, or boric powder. Ichthyol in the proportion of 5 parts to 100 of glycerin may be applied on a tampon, or pledgets of cotton saturated in lead water and laudanum may be used. Where the irritation is caused by worms, rectal injections of an infusion of quassia in the strength of one to two ounces to a pint of water may be used with benefit. The aphthous form should be treated not only by local applications, but also by attention to the general health, efforts being made to build the patient up so far as possible by tonics and nutritious food.

Gonorrheal vulvovaginitis is best treated by local applications of corrosive sublimate, 1 : 5000; muriatic acid, 4 : 100, or creolin, 1 : 500. These should be applied by means of pledgets of cotton placed between the labia, or may be injected in the vagina by means of a small rubber catheter attached to a fountain syringe. Before applying any of the above, it is generally well to wash the parts thoroughly with warm water and Castile soap, after which they should be carefully dried by means of pieces of absorbent cotton. The parts may be dusted with a powder consisting of bismuth and starch, or pulverized oxid of zinc and boric acid.

ACETONURIA.

Acetonuria is a condition which is sometimes found in the course of acute febrile diseases, probably from the excessive waste of the nitrogenous tissues of the body during the course of these diseases. A small quantity of acetone may rarely be found in the urine of healthy children. It is also occasionally recognized in the urine of epileptics or those affected with diabetic coma.

LITHURIA.

"Lithuria is a condition in which there is excessive elimination in the urine of uric acid or of urates" (Holt). It is probable that it is caused by the destruction of nuclein in the cells of the body, and particularly the white blood-cells. It is found most commonly in

conditions in which malnutrition or a chronic lowered state of nutrition is a prominent feature. It is also seen in patients affected with rheumatism, chorea, and many other diseases. The treatment is that of the condition causing it.

INDICANURIA.

Indican is found in the urine as a derivative of indol. Indol is formed in the intestine from putrefaction of proteids, or occasionally it may appear in the course of chronic suppurative disease. Holt gives the following, known as Jaffe's test, for its presence: Put into the test-tube equal quantities of urine and enough hydrochloric acid to fill the tube to within $\frac{1}{2}$ of an inch of the top, and then shake. If there is much indican present, a dark-blue or purple color will be produced. Next add sufficient chloroform to completely fill the tube and again shake thoroughly. It is important that the chloroform should completely fill the tube so that no air-bubbles get in. If after standing the chloroform assumes a deep blue or violet color, there is certainly indican present. The reaction may not appear at first, but will occasionally be seen after standing several hours. Sometimes when no reaction is obtained it may be produced by the addition of a drop of a saturated solution of chlorid of lime or peroxid of hydrogen. It is important that not more than one drop should be added at a time or the blue color may be bleached.

According to Herter, indicanuria may be present in chronic forms of intestinal indigestion, chronic constipation, acute putrefactive diarrhea, or during an attack of epilepsy. It is, however, most commonly found as a symptom of chronic intestinal disease, and the treatment should be that of the condition causing it.

ANURIA.

Failure to void the urine may be a symptom in a number of diseases. It may sometimes accompany an attack of hysteria. Bailey reports a case of absolute suppression, which, as far as the author could tell, existed from October until March. It apparently resulted from hysteria. Occasionally we find the condition arising from congenital malformation of some part of the urinary tract. In the majority of

cases the absence of urinary excretion is of short duration and causes no serious symptoms.

The **treatment** should consist in the administration of diuretics and hot packs, or, where any symptoms of uremia arise, the skin and bowels should be stimulated to their utmost capacity in order to relieve the system of the excess of toxic material. At the same time the excretion of urine should be invited by allowing the patient to drink water freely, and hot applications may be made over the bladder.

HEMATURIA.

Blood may appear in the urine as a symptom from a variety of causes, both constitutional and local.

Causes.—Not uncommon constitutional causes of hematuria in young children are rickets and scurvy. It is also a symptom occurring in purpura hæmorrhagica, in acute hemoglobinuria, or Winckel's disease. Occasionally it is associated with the continued fevers, especially malaria, and with acute poisoning by such drugs as turpentine or cantharides. Not infrequently it is one of the symptoms of stone in the bladder. An inflamed prostate, a very rare condition in children, may also produce hematuria, and it is occasionally seen during an attack of acute nephritis. Various tumors of the bladder may have hematuria as a coexisting symptom. A trace of blood may be seen in the urine after violent exercise. The color of the urine may be a bright red, a smoky hue, or may be a greenish-brown or almost black. As a rule, the further the point of hemorrhage is from the orifice of the urethra, the more thoroughly the blood becomes mixed with the urine and consequently the darker the latter appears. On the other hand, the brighter red the urine is, the nearer the hemorrhage to the external orifice. Occasionally, where blood arises from a pyelitis or cystitis, traces of pus will be found associated with the bloody urine.

The **treatment** will depend largely upon the cause. As hemorrhage is in itself more a symptom than a disease, the causative condition must be treated. When it is produced by a lowered state of the blood, as in scurvy or purpura, the condition of the system must be improved by the administration of tonics. As very frequently hemorrhage exists as a symptom of stone in the bladder,—may, indeed, be the only symptom present,—the bladder should be examined, and if a cal-

culus is found it should be removed promptly. When arising from cystitis, the bladder should be washed out with a mildly alkaline antiseptic fluid.

PYURIA AND CHYLURIA.

Pus is occasionally found in the urine. The most frequent cause is cystitis. It may, however, arise from an abscess in one or both kidneys, or, in female children, from inflammation of the vulva and vagina. Pyuria may appear in the course of several of the acute fevers, especially where the patient is much depressed in health. Lastly, it is not infrequently seen in renal calculus.

The **treatment** will depend upon the cause. Chyluria is most commonly seen in tropical countries, although cases have been reported from the United States and Europe. The disease known as parasitic chyluria is due to the presence in the blood of a small parasite known as the *Filaria sanguinis hominis*. This parasite, as a rule, has its greatest state of activity in the afternoon and evening, although it is occasionally found in the blood at all times of the day. The symptoms of chyluria may be exceedingly mild. In the parasitic form the symptoms are usually chills, accompanied by a temperature much above or below the normal. Occasionally hemorrhage may be a coexisting symptom. The urine is decidedly milky—in fact, may have a strong odor of milk. Casts are rarely found in it.

ENURESIS.

Synonym.—INCONTINENCE OF URINE.

Definition.—Enuresis is a condition in which the urine is involuntarily discharged from the bladder. It may appear either during the day or night, or both. It may be periodic or continuous. During early infancy—that is, before the termination of the first year of life—enuresis may be described as a physiologic condition, the young infant possessing no control over the bladder. After this time for a varying period dependent upon the means employed to teach the child to control its bladder, the urine will be evacuated at stated intervals, and the involuntary emptying of the bladder may be regarded as a symptom of some pathologic condition.

Causes.—These may be described as organic and functional.

Among the former we have malformations of the kidneys, ureters, or bladder, or inflammations of any of these organs. Involuntary evacuations of urine may also be a symptom of various lesions of the brain or spinal cord. In the largest number of cases enuresis is a symptom of innutrition or malnutrition, or some disturbance of the equilibrium of metabolism, and evidences of such disturbances are present in a large number of cases. Evidence of this may be found in rachitis or scrofulosis, or secondarily may be the results of these conditions, or of renal or cardiac disease. In another group, the evidences are less pronounced, and in this class we may have intestinal disease, lithemia, or polyuria. In a third class the exciting cause may be more obscure, or may manifest itself simply in a disturbance of the nervous equilibrium shown as a mild or severe neurosis. In this class of cases many facts, the result of clinical observation or physiologic research, lead us to look for the causes of such disturbances in the highly sensitive nerve-cells.

The physiology of micturition may be described as follows: When the bladder becomes full, an impulse passes up to the cerebral center (see diagram, page 282); an inhibitory impulse is then despatched to the sphincter center in the fourth lumbar segment. The impulse then passes out to the sphincter urethræ, that muscle is relaxed, and the patient voluntarily contracts the abdominal walls, squeezing a few drops into the urethra. These drops generate afferent impulses which pass to another center in the lumbar cord—viz., the motor center for the bladder walls or the "detrusor center." Afferent impulses continue, and micturition goes on as a reflex act. It is evident that if we cut off the cerebral arc, we would have the condition seen in enuresis. This, indeed, is the condition found in the idiot or imbecile, or in children in whom a lesion of the sensory or motor portions of the cord exists. In the majority of cases it is probable that the sphincter center in the fourth lumbar segment is at fault (James H. McKee). When the act of evacuation of the bladder occurs during sleep, at which time the inhibitory influence of the will is in abeyance, the physiology of enuresis is, to some extent, the same as where the cerebral part of the nervous system is at fault through other causes. In some cases the patient may dream of the act, and the evacuation may occur during this dream. At other times the bladder may be emptied without any knowledge of the patient. In the majority of cases the sleep is abnormally long and deep, and here

it is probable that the sphincter centers must be at fault. It sometimes happens that the incontinence may be produced by a reflex irritation set up by a local cause, as a vesical calculus, a cystitis, or vulvitis, or, in boys, an elongated foreskin. Hyperacidity of the urine may be a cause. In one case coming under the care of one of

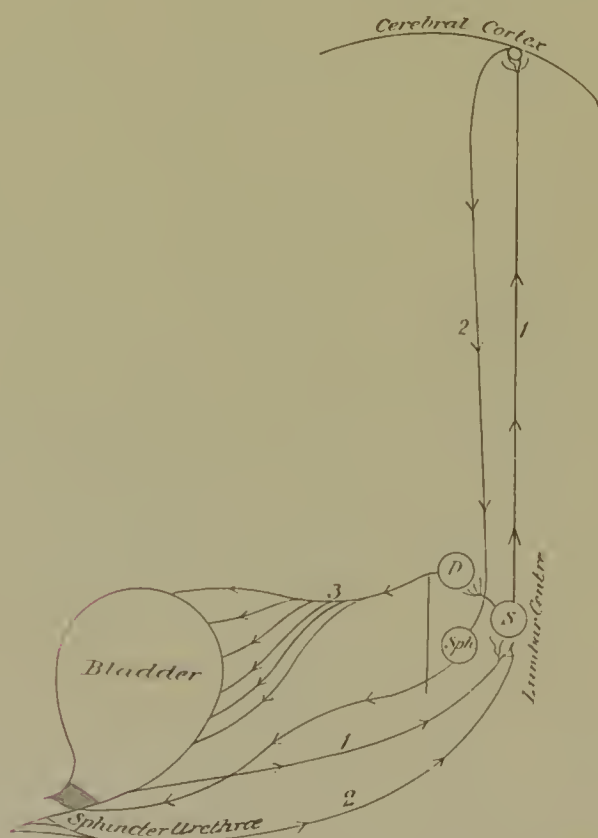


FIG. 21.—DIAGRAM SHOWING REFLEX NERVE ARC OF THE ACT OF MICTURITION.*

the authors, the enuresis could be traced directly to the habitual drinking of coffee.

The **symptoms** consist in the involuntary evacuation of the bladder.

The **prognosis** depends entirely upon the cause. In a certain proportion of cases the condition will not last for a very long time, yet

* For a thorough description of the physiology of micturition, see article by Dr. James H. McKee, "University Magazine," December, 1897.

in many others success will not be reached except by the long-continued administration of remedies of many sorts, and a careful and thorough investigation as to the cause of the trouble. A certain proportion of cases seem to baffle all our efforts, continuing for months, sometimes with long periods of intermission, during which we are tempted to believe them cured, only to find the incontinence returning. A case of enuresis should not be considered cured until several months, or even a year, elapse without the return of the condition.

Treatment.—No matter what form of treatment is used, the results are often discouraging. Patients will temporarily improve; indeed, may seem to be cured, only to lapse again into the old condition. On the other hand, spontaneous cures are sometimes seen. Occasionally they may seem to result from nothing more than a change of surroundings or of diet. Buckingham speaks of a boy, upon whom various methods of treatment had been tried, who was cured during a vacation in which he cultivated a taste for athletics. There is no class of cases in which the etiology should be more carefully studied than those affected by enuresis. Central and spinal lesions and various malformations of the urinary apparatus must be sought for. The urine must be constantly examined, and, if found to be highly concentrated, the patient may be greatly benefited—in some cases absolutely cured—by simply diluting it. Where phimosis is a cause, it should be treated by the methods before given; of these, circumcision is probably the best. Some instances of nocturnal incontinence of urine may be prevented by making the child empty the bladder thoroughly just before retiring for the night; or if the incontinence occurs during deep sleep, the child may be awakened once or twice during the night to empty the bladder. There are instances, too, where the sleep is light and shallow, and these are relieved by sulphonal at night. Where the patient has a highly sensitive vesical sphincter, it may be necessary to raise the foot of the bed so as to keep the urine from pressing against that part. A regular mode of life, with outdoor exercise, is especially beneficial. In cases of lowered nerve action strychnin is indicated. while in the opposite class of cases, those with extreme irritability of the nerve-centers, bromids, atropin, or belladonna are the indicated remedies. These drugs should be given until some decided symptoms of their action are manifested. In diseases attended by congestions the use of ergot has been recommended. Cold douches to the perineum and

faradism have been of some use. The passage of a cold sound in boys is recommended. Urethral electrization is often efficacious. Increasing doses of atropin or hyoscin hydrobromate is the most reliable measure.

STONE IN THE BLADDER.

In children three varieties of stone are met with. The form of calculus in the bladder most frequently found is that known as the uric acid formation, which, according to statistics quoted by J. William White, composes from two-thirds to five-sixths of all calculi found in the bladders of children. This variety may be made up entirely of uric acid, or may be composite, containing oxalate of lime and the urates of ammonium and sodium. The uric acid stone is usually not very large and of oval shape, varying in color from a yellowish-white to a dark brown. Externally this form of calculus may be smooth or slightly roughened, while on section it is found to be laminated or amorphous. The laminated variety is extremely hard, and capable of a high polish. The amorphous form is easily broken, and resembles coarse sand.

The second variety is composed of oxalate of lime, and is sometimes called the mulberry calculus. It is generally round, covered with small spicules, and its color varies from gray to brownish-black.

The third variety, known as the urate of ammonium calculus, is only occasionally found. It is a smooth, flat, oval stone, brittle, and of a yellowish color. Other varieties of calculus, such as the mixed phosphate or the ammoniomagnesium phosphate, and those composed principally of phosphate or carbonate of lime, are occasionally seen. Cystic oxid, xanthic oxid, and other varieties of stone have been described, but are extremely rare. The size of vesical calculi varies widely. They may be single or multiple, and are described as being *free* when found loose within the bladder and *attached* when held to the bladder wall either by a fold of mucous membrane or band of lymph (White).

Causes.—But little is known as to the cause of cystic calculus in children. It is possible that an inherited gouty tendency may have something to do with causation, but, on the other hand, it has been demonstrated many times that children of the poor, or those having few of the luxuries, or even the necessities of life, are more frequently

affected than children born in better circumstances. Boys are more subject to stone than girls. A predisposition seems to run in certain families, and the inhabitants of some locations are more frequently affected than those of others. It might be supposed that the water-supply of a certain location could have something to do with this, yet it has been proven many times that it has not. Race seems to have some influence, it having been shown that the negro is affected far less frequently than the white races.

In almost every case stone has its origin in the kidney, and it is believed that the uric acid infarcts so often seen in the kidneys of newly-born children form the first stage in the production of calculus, and that the large quantity of uric acid which is present in early life will explain the frequency of this form of calculus, or its presence may act as a nucleus of other forms of calculi which may later develop in the bladder. Occasionally the stone may be formed around a nucleus which is composed of some foreign body which has been passed into the bladder. This is, however, very rare.

Symptoms.—The group of symptoms which points to the presence of stone is in most respects the same in children as in adults. In many cases the first evidence of its presence will be shown by an attack of intense pain, accompanying a group of symptoms known as nephritic colic. In the midst of health the child is suddenly attacked by violent pain, first felt in the lumbar or hypochondriac region, and extending toward the scrotum and end of the penis. The testicle on the side affected will be drawn up by a spasm of the cremaster muscle. Pain is also felt in the groin and thigh on the affected side. The patient has a continual desire to pass water. The attack of colic is accompanied by sweating, which is profuse, and the skin becomes cold and clammy. Pain may be so intense as to cause convulsions and collapse. The urine is passed frequently, but in small amounts, and is very highly colored. Actual suppression may occur as the stone makes its progress along the ureter, and will only cease permanently when it has reached the bladder, at which time the pain also ceases suddenly. After the stone has reached the bladder, the foregoing group of symptoms gives place to others.

The principal symptom of stone in the bladder is increased frequency of urination. The desire to evacuate the bladder may be continuous, amounting to actual incontinence. This symptom is worse

by day, when the patient is up and around, than at night. It is increased by motion, and its amount depends to a certain extent on the shape of the stone. Occasionally retention of urine occurs. This may be produced either by the stone acting as a ball-valve and stopping the flow of urine, or, in some rare instances, is reflex. The pain is of a darting, burning character, increased during urination, particularly at the termination. It is caused by the mucous membrane of the bladder coming in contact with the stone. The pain, however, is rarely felt in the bladder, but is referred to the under surface of the penis some distance behind the external meatus. It is often so severe as to cause convulsions; it continues until there has collected in the bladder a sufficient amount of urine to raise the mucous membrane away from the stone. Various reflex pains, referred to different parts of the body, are not infrequently associated with vesical calculus; these may be felt in the rectum or perineum, and occasionally in various parts of the body far removed from the seat of the trouble. From the constant irritation of the penis the habit of masturbation may be set up, or from handling of the parts the foreskin may be rendered abnormally long, while in some cases phimosis or paraphimosis are produced by this cause. Cystitis is almost always present. From the constant efforts at straining prolapse of the rectum may be produced. Where the flow of urine is stopped by the calculus obstructing the vesical orifice, the child may assume various peculiar positions while evacuating the bladder in order to cause the stone to fall away from the opening of the urethra and allow the passage of urine. Hematuria may occur, but is said to be rarer in children than in adults. As sequelæ we very frequently note chronic cystitis and, sometimes, pyelitis. Dilatation of the ureters may occur, and from extension of inflammation there may arise nephritis or even suppurative pyelitis.

Diagnosis.—Stone in the bladder may be confounded with one of several conditions. The diseases most likely to be mistaken for it are a contraction of the urinary meatus, cystitis, phimosis, the condition known as irritable bladder, vesical tumors, and renal calculus. None of these conditions will, however, show a group of symptoms as severe and well-marked as stone. The surest factor in diagnosis, however, is the finding of the stone by examination by means of a sound.

Treatment.—In all cases of irritability of the bladder in children,

especially when there is pain during or immediately following the act of urination, and when phimosis or malformation of the penis and urethra does not exist, the bladder should be carefully examined for stone. It is best to administer an anesthetic in order to produce complete relaxation of the part and to prevent the child from struggling and possibly receiving injury at the time of examination. The bladder should then be filled with warm solution of boric acid to distend the walls and give greater space for the movements of the searcher. By the careful use of a sound in the bladder the presence of a stone can readily be demonstrated by the characteristic "click" which the instrument makes in coming in contact with the stone. Sometimes this sound can be heard some distance from the patient.

If the stone be small, or even of moderate size, it can be crushed by a lithotrite and evacuated at one sitting—just as is done in adults. Of late years this mode of operating has been very extensively practised with admirable results. In very young children the operation of lateral lithotomy is best; it is done quickly, with little shock, and the mortality is very slight. In older children, and especially if the stone be larger, the suprapubic operation should be selected.

The continued use of piperazin has produced much relief and occasionally induced the passage of a small stone.

CYSTITIS.

Inflammation of the mucous membrane of the bladder is much rarer during infancy and childhood than in adult life.

Causes.—The most common cause of vesical inflammation is stone. It may also be produced by a retention of urine within the bladder caused by a contracted meatus and from phimosis. The long-continued administration of irritating drugs may produce it, or a growth within the meatus may act as a causal factor. A form of very severe cystitis may appear in the course of tuberculosis in children, and is due to tuberculous infection of the bladder. Occasionally it is produced by an extension into the bladder of any infection from without.

Symptoms.—The symptoms of cystitis in children are practically the same as those in the adult. There is some rise of temperature and fretfulness. Indeed, the child may appear quite ill. Micturition is frequent and painful, the urine, which is passed in small quantities, is of

high specific gravity and a high degree of acidity, but on standing it decomposes quickly and becomes alkaline. Its color is reddish; pus will be present in varying quantities, and can be demonstrated by microscopic examination; as will also a considerable quantity of squamous epithelium from the bladder and some blood.

CHRONIC CYSTITIS.

Chronic cystitis arises very commonly from stone in the bladder or the presence of foreign bodies—a tumor—or tuberculosis. The acute form, unmitigated by treatment, may progress into the chronic variety.

The **symptoms** are painful and frequent micturition, the passage of urine later becoming almost constant, and associated with an irritation of the external genital organs, caused by an ammoniacal condition of the urine. Prolapse of the rectum is very commonly associated where the irritation is caused by the presence of a stone. The urine is alkaline, turbid, and distinctly ammoniacal. Traces of albumin are commonly found in it, and there is always a considerable quantity of thick ropy mucus. Microscopic examination will demonstrate epithelium from the bladder, some blood, and large numbers of crystals of triple phosphate and urate of ammonium.

Prognosis.—In the acute form the prognosis is good, providing the cause can be removed. Where prompt treatment is not instituted, the condition rapidly passes into the chronic form, which is very persistent and hard to control. The outlook for cure in the chronic form depends very much upon the cause and the duration of the attack. It must not be forgotten that cystitis may appear as a secondary consequence of diseases of the kidneys. The cause of the disease must always be sought for and removed if possible. The patient should be kept at rest in bed. The diet should consist of milk. Water should be given frequently, and various diluent drinks, such as flaxseed tea, mucilage of acacia, and the citrate or acetate of potash, may also be made use of. Warm baths, at a temperature of 103° to 105° F., should be used to promote free diaphoresis. If there is much pain, opium may be used by suppository or enema, but it must be remembered that this drug should be given with great caution to children. Various agents are of use in the treatment of cystitis; among these may be mentioned tincture of aconite, the spirits of nitrous ether, benzoate of

sodium, camphorated tincture of opium, and many others. Mineral waters, such as Vichy and Buffalo Lithia, may be given with benefit. Washing out the bladder in cases of chronic cystitis is of the greatest use. The fluid used may consist of plain distilled water or a fifty per cent. solution of boric acid. This should be allowed to flow in slowly, and should be at a temperature of about 100° F.

DISEASES OF THE KIDNEY.

In the study of the inflammations and degenerations of the kidneys we are at once confronted with the difficulty of making a classification which will be in accordance with the most modern well-established knowledge on the subject. As our knowledge of the pathology of these diseases increases, the entire classification of the subject must frequently change to meet the requirements of the results of modern investigation. In our descriptions of the various diseases of the kidneys in this book, we will follow the example of Emmett Holt, taking the classification as used by Delafield as our standard, it being the one that comes nearest to the teachings of the present day.

ACUTE CONGESTION OF THE KIDNEY.

Synonyms.—RENAL HYPEREMIA; ACUTE RENAL CATARRH.

Causes.—Acute renal congestion may occur as the result of traumatism from the use of certain irritating drugs—such as turpentine or cantharides—or from cold. The most common cause is the acute infectious diseases.

Pathology.—The blood-vessels of the kidney are engorged with blood, and, following this congestion, there is frequently an escape of serum or red blood-cells.

Symptoms.—The symptoms of renal congestion itself are rather varied. There is generally some headache, pain in the back, and general malaise. The urine is scanty, highly colored from the presence of red blood-cells or blood-casts, and is of high specific gravity.

It always contains some albumin. This may differ markedly in amount. The duration of the attack may vary considerably.

The **prognosis** will depend entirely upon the cause of the congestion and whether or not the congestion is the beginning of an attack of acute nephritis.

Treatment.—The bowels should be freely opened, preferably by the use of salines or calomel; the latter is especially useful on account of its diuretic action. Hot vapor baths should be employed to produce diaphoresis. Mild counterirritation over the kidneys by means of dry cups or hot poultices should be employed. Where irritability of the bladder is present, camphor may be used, or, in some cases, small doses of camphorated tincture of opium may be given with benefit.

CHRONIC CONGESTION OF THE KIDNEY.

Causes.—Chronic renal congestion may be produced by the continuance of the acute form. It is most frequently seen as the result of an interference with the return circulation of the kidney which may appear during an attack of heart disease. It is also very common in chronic bronchial pneumonia or chronic pleurisy. It may be found where the circulation is interfered with by reason of an abdominal tumor.

Pathology.—The kidneys are enlarged, darker colored than normal, and of firmer consistency. The entire organ is distended with blood. The capillary vessels are engorged, their walls being thickened.

Symptoms.—The symptoms are those of the acute form, continued over a longer time. The urine is always scanty and of high specific gravity. The microscope will reveal the presence of albumin and casts. These may not, however, be regularly present. The bowels are generally constipated; irritability of the bladder is commonly a feature.

Treatment.—In addition to the treatment of the condition causing the congestion, an effort should be made to increase the amount of urine by the use of digitalis, especially the infusion; camphorated tincture of opium, either alone or combined with sweet spirits of niter; the alkaline diuretics, caffeine, and other drugs of the

same order. The bowels should be kept open by salines and hot baths, or vapor baths should be used to promote diaphoresis. Where the amount of urine passed is extremely small, nitroglycerin may be used with benefit.

ACUTE DEGENERATION OF THE KIDNEY.

Causes.—Acute degeneration of the kidneys is very frequently present in the course of acute infectious diseases, but it is found most often and is most marked in cases of diphtheria, scarlet fever, and acute pleural pneumonia. It may appear during the course of any disease accompanied by long-continued high temperature. Holt states that in all probability it is caused by direct irritation of the epithelium of the tubules by toxins eliminated by the kidneys. Irritating drugs may also produce it.

Pathology.—The color of the kidney is pale, and the whole organ is somewhat enlarged. The cortex is thickened and the straight tubules are marked by yellowish-gray lines. The epithelium of the tubules undergoes granular degeneration. Some exudation of serum may take place (Holt).

Symptoms.—There are no special symptoms connected with this form of renal disease other than those which accompany diseases producing it. The urine will contain a moderate amount of albumin and sometimes a few granular and hyaline casts.

Treatment should consist in the use of a liquid diet and diuretics, in addition to the treatment of the condition producing the degeneration.

ACUTE EXUDATIVE NEPHRITIS.

Synonyms.—ACUTE PARENCHYMATOUS NEPHRITIS; ACUTE SEPTIC INTERSTITIAL NEPHRITIS; ACUTE DESQUAMATIVE NEPHRITIS; ACUTE TUBULAR NEPHRITIS.

Definition.—Acute exudative nephritis is an inflammation of the true renal epithelium. In the majority of cases it is either directly or indirectly of septic origin.

Causes.—This variety of nephritis is very common among infants and children of all ages. It is most frequently seen as a secondary affection appearing in the course, or following an attack of, the acute

infectious diseases, especially scarlet fever and diphtheria. Occasionally it follows an attack of typhoid fever, measles, varicella, scurvy, meningitis, influenza, and the acute diarrheal diseases. Holt states that in rare instances it may follow eczema. Various irritating drugs and traumatism may occasionally produce it. It is possible that in some cases occurring in infants the septic infection causing the disease may occur through the umbilicus, as in the case reported by E. H. Root.

Pathology.—The description of the pathologic anatomy of acute nephritis is quoted largely from Emmett Holt's admirable work on "Diseases of Children." In infants and young children the predominant pathologic feature is the exudation of leukocytes. The renal epithelium and glomeruli undergo inflammatory changes. There is an exudation of blood plasma with leukocytes and red blood-cells. Enlargement of the kidney occurs, the whole organ being softened and edematous. The most marked changes occur in the cortex, which is thickened and is usually of a yellowish-white color, sometimes mottled or speckled with red, due to small hemorrhages. Occasionally the entire organ is congested. Section of the kidney will show in some cases that the inner portion, as well as the surface, may be mottled with small yellow spots, each spot being a small collection of pus. These little abscesses may vary in size from a pin's head to a pea. On microscopic examination the tubular epithelium will be swollen, loosened, and degenerated. The tubules themselves may be dilated, and may contain red and white blood-cells and degenerated epithelium. Marked changes occur in the glomeruli. The cells covering the capillary tufts, and, indeed, the capillaries themselves, undergo swelling and proliferation. The cavities of the capsules frequently contain masses of red and white blood-cells and the smaller blood-vessels may contain bacteria. The stroma and venous capillaries contain accumulations of leukocytes, occurring usually in irregular patches. No blood serum may accompany the transudation of leukocytes, and for this reason the urine may contain no albumin. In all his post-mortem examinations Holt states that the most prominent feature in nephritis in young infants was the excessive exudation of leukocytes.

Symptoms.—Two forms of the disease are usually recognized—the primary and the secondary. In the primary form the severity of the symptoms will depend very much on the age of the patient, the

disease being much more dangerous in infants and young children. In the primary form occurring in infants the symptoms are often obscure; so much so, indeed, that the origin of the disease may be misunderstood. The attack begins, in the majority of cases, abruptly, with a high fever and vomiting, the temperature very often rising as high as 103° and 104° F.; in bad cases it may even reach 105° . The type is usually irregular. Holt states that, in his own cases and in those which he has collected from the experience of others, diarrhea and vomiting were noted in half the number of cases observed. Dropsy may exist to a slight degree, but is very often absent. Anemia is a prominent symptom, being present in nearly every case. Holt considers this a valuable diagnostic point. The nervous symptoms are usually quite prominent. These consist of restlessness, twitching of the muscles, or, in more marked cases, even convulsions. On the other hand, the mind may be dull and apathetic. True uremic coma is very seldom seen. The duration of the disease will vary from eight days to four weeks, the average being about two and a half weeks. Cases progressing to a fatal termination may develop symptoms of a true typhoid condition. The urine is slightly decreased in quantity in the majority of cases; where the attack is severe, however, the amount passed may be much less than normal, and, indeed, actual suppression may occasionally occur. Albumin is generally present in the early part of the attack and always during a later period. The quantity is usually not great. Microscopic examination of the urine will show the presence of hyaline, granular, and epithelial casts. Blood-casts are rare. Examination will also demonstrate the presence of pus-cells and renal epithelial cells with some red blood-corpuscles. In older children the disease is much less severe, and the outlook for a favorable termination better. The attack begins less abruptly and the febrile symptoms are less marked. Dropsy is slight, or, indeed, may be absent altogether. The urine is slightly diminished in quantity, and the amount of albumin much less. Casts may be present—usually the varieties before described. The general symptoms are much milder than in the form seen in infants.

The secondary form of the disease usually appears during the course of one of the infectious diseases. The constitutional symptoms are often not marked. The urine may be somewhat diminished, and the

microscopic appearances are about the same as those in the two preceding varieties.

Prognosis.—Holt states that in the twenty-three cases investigated in which the disease occurred in infants, the mortality was fifteen; and of his own cases, nine in number, eight died.

Treatment.—The same as in other forms.

ACUTE DIFFUSE NEPHRITIS.

Synonyms.—ACUTE GLOMERULONEPHRITIS; ACUTE BRIGHT'S DISEASE.

Causes.—In the majority of cases acute diffuse nephritis follows an attack of one of the infectious diseases, particularly scarlet fever, in which case it is generally admitted that the exciting cause can be attributed to the scarlatinal poison, probably the result of direct irritation from the toxins of the disease. It sometimes follows diphtheria where the exciting cause is probably toxic, the action of the poison being similar to the scarlatinal complication. Cold and exposure have been attributed as causes, and in some cases the etiology is obscure. As predisposing causes of the post-scarlatinal variety it has been stated that allowing the patient to get up too soon after the disease or the too early administration of solid foods have a tendency to aid in the irritation of kidneys previously weakened by the scarlatinal poison. The frequency of the disease as a sequela of scarlet fever varies considerably with epidemics. Blows and injuries of the back have also been given as causes. The acute diffuse nephritis is much more frequently seen in children and young adults than in the old.

Pathology.—The main points in the morbid anatomy of the kidneys are as follows: The entire organ is enlarged, often to a considerable extent, and is softer than normal. In the early stages of the disease the kidneys are sometimes considerably congested, but after the disease is well established they are a yellowish-white color mottled with red. Thickening of the cortex occurs, this portion being usually yellow, and showing a distinct contrast to the pyramids which are red. Microscopic examination shows the characteristic changes of this variety of nephritis, which consist in the formation of connective tissue cells in the stroma and proliferation of the cells forming the capsule of the Malpighian bodies. The longer the duration

of the disease, the more dense and fibrous in character will the connective tissue appear. Finally, the glomeruli undergo permanent change; the tufts will be reduced by the growth of the endothelial cells lining the capsule, which may ultimately form new fibrous tissue (Holt).

Symptoms.—The primary form of acute diffuse nephritis may begin suddenly, with fever, the temperature often rising to 101° or 102° F., and when the attack is severe, it may rise much higher. There is pain in the lumbar region, headache, vomiting, and decrease in the amount of urine. Dropsy is present in the majority of cases. Occasionally the onset is slower and the symptoms less severe, the dropsy appearing slowly and the urine gradually decreasing in amount. The post-scarlatinal form begins insidiously; usually in the third or fourth week of the disease. In this form moderate fever, scanty urine, and dropsy are the principal symptoms. The dropsy manifests itself in a manner which is almost characteristic; in amount it is well marked; it usually appears in the face, then in the feet, from which it ascends up the leg, and may even affect the scrotum or external labia. It may continue to progress over the whole body, generally producing anasarca. Serous effusions into the pleura or peritoneum, and more rarely into the pericardium, may occur. Anemia is very often present; always if the disease is well marked. In cases of some duration the skin assumes a peculiar waxy appearance, which is one of the characteristics of the disease.

The Urine.—As a rule, this is considerably diminished in quantity; indeed, suppression is not uncommon. Albumin is always present in large amounts. The color of the urine is smoky or reddish-brown, due to the presence of red blood-globules or hemoglobin. The specific gravity is generally low; the amount of urea eliminated is below normal. The microscope shows the presence of casts in great variety. Hyaline, granular, and epithelial casts are always present, and blood-casts are not rare. Holt states that twisted or corkscrew casts are occasionally seen, and that Ripley, of New York, regards these as having grave significance, showing that all parts of the kidney are involved. Leukocytes and red blood-cells, with a large variety of cells from the renal epithelium, are present. In cases of ordinary severity which tend toward a favorable termination the symptoms should subside in from one to three weeks. The

edema gradually passes away and the temperature returns to the normal. The quantity of urine increases, and the amount of urea excreted, which during the attack has been much below the average, gradually becomes greater, while the amount of albumin and the number and variety of casts which have been present during the disease begin to decrease. It should not be forgotten that it is quite possible that a few casts and a trace of albumin may persist for a considerable time. The disease, however, may increase in severity, the temperature continue high, the pulse become full, rapid, and of high tension. The urine, which before was scanty, may now be actually suppressed and symptoms of uremia follow. The attack of uremic poisoning may begin with symptoms of restlessness or apathy, headache and dimness of vision being sometimes seen. Later, the patient may pass into a state of stupor or coma, or have convulsions. Diarrhea is not an uncommon early symptom in children.

Complications and Sequelæ.—The most frequent complications are pneumonia, pleurisy, pericarditis, or endocarditis. Occasionally, though rarely, meningitis and edema of the glottis may complicate the disease.

Prognosis.—In so far as the recovery from the acute attack is concerned, the prognosis is good; the majority of patients recover. There is, however, considerable danger of the disease progressing into the chronic form, in which the outlook for absolute recovery is not so favorable. The existence of severe nervous symptoms, stupor, intense headache, dimness of vision, or the appearance of uremia, would make the outlook less hopeful. The urine should be carefully examined at frequent intervals, as the amount of urea and the number and variety of the casts are a valuable aid in prognosis. Of much less importance is the quantity of albumin present. Holt gives his opinion that in cases where no suppression of urine occurs, where there are no symptoms of uremia and no complications, the chances of recovery are good, providing the child is over three years of age. In younger children the prognosis is not so favorable. Patients suffering from this disease require constant watching for a long period of time. Where the case progresses into the chronic nephritis, the outlook, although rather doubtful as to the chances for absolute cure, is by no means hopeless so far as the life and comfort of the patient go. With care and attention to diet and to the general rules of life,

many of these patients live for many years. Relapses are frequent, and death may occur during one of these or the patient perish from pneumonia, edema of the lungs, or from some intercurrent malady.

Treatment.—Of primary importance in the therapeutics of acute diffuse nephritis is the stimulation of the skin as the most important adjunct in eliminating the excrementitious substances of the body and thus aiding the crippled kidneys. For this purpose frequent sponging with hot water, warm baths, or, what is often better, repeated hot packs, are of the greatest use. Poultices to the lumbar region are most efficacious. The bowels must be kept freely opened by salines and calomel. These should be given in quantities sufficient to produce two or three movements daily. The urine should be diluted as much as possible in order to decrease its irritating properties. With this in view the patient should be made to drink two or three glasses a day of filtered water, or, if it is preferable, one of the numerous alkaline waters. Some authorities recommend that two or three grains of the citrate of potassium be added to a glass of water. The diet should be fluid; preferably milk. Should milk not be well borne, then such preparations as whey, buttermilk, koumiss, or junket may be used. If the nephritis follow an attack of scarlet fever, it is generally recommended that the patient be kept in bed for at least a week after the temperature has become normal. In severe cases, where the fever is high, the urine scanty, and the amount of edema considerable, diaphoresis should be maintained by the use of the hot pack or vapor bath. Pilocarpin may be used hypodermically, and given in doses of $\frac{1}{80}$ of a gr. to a child of three or four years. In order to guard against the depressing effects of the drug, stimulants should be conjointly given. Counterirritation should be applied over the kidneys by poultices or a mustard plaster. The bowels should be kept open by the use of calomel and salines. In cases where symptoms of uremia occur, the temperature being high, nitroglycerin should be given in quantities sufficient to produce the effects of the drug. Holt recommends that $\frac{1}{300}$ of a gr. be given every hour for three or four doses. In some cases hypodermic injections of morphin may be of service.

Venesection has also been recommended as a means of rapid depletion where the symptoms are urgent. For the anemia which is very commonly seen, iron is required. Where the disease has existed for some time or has passed into the subacute form, the patient had best be

sent to a warm climate, especially during the winter months. Flannel underclothes ought to be worn next the skin, and every precaution taken to prevent the patient taking cold.

CHRONIC NEPHRITIS.

Under the title of chronic nephritis will be described two forms of chronic inflammation of the kidney structure, both of which are rarely seen in children, yet they occur with sufficient frequency to warrant at least passing notice. The varieties of chronic nephritis are, first, *chronic diffuse nephritis with exudation*, known also as *chronic parenchymatous nephritis* and the *large white kidney of Bright*; secondly, the so-called *waxy* or *lardaceous kidney*; thirdly, *chronic diffuse nephritis without exudation*, known also as granular kidney, sclerosis of the kidney, contracted kidney, or chronic interstitial nephritis.

Causes.—The most frequent cause of the first variety is a continuation of the nephritis following an attack of scarlet fever or other disease of the same class; in fact, the etiology of this form of chronic renal inflammation is practically the same as that of the preceding forms described. Waxy kidney is most apt to follow prolonged suppuration, especially that accompanying diseases of the bones and joints. True chronic interstitial nephritis—the variety described under the second heading—is exceedingly rare in childhood. When occurring, the causes are generally hereditary syphilis, tuberculosis, alcoholism, and chronic valvular diseases of the heart. Holt states that in nearly all cases the children suffering from this are over seven years of age.

Pathology.—1. *Chronic Diffuse Nephritis with Exudation.*—Enlargement of the kidneys occurs, the surface being smooth or slightly nodular. The enlargement may be so great that the organ attains twice the normal size, and the capsule can easily be separated from the kidney itself. The color, not only of the external, but of the cut surface also, is yellowish-white. Considerable tumefaction of the cortex is found on section. Microscopic examination will show the epithelium to be swollen, while degeneration of a granular or fatty character follows. The convoluted tubes are dilated and thickened, while their lumen contains broken-down granulated epithelium and cast matter. In some cases atrophy of the tubes occurs. The glomeruli will often

Symptoms.—

be found compressed and atrophied from an excessive formation of new connective tissue. A fatty degeneration of the tubular epithelium is sometimes seen.

2. *In the condition known as waxy degeneration* there is considerable enlargement of the kidneys, the organs being grayish in color, translucent, and glistening. Their consistency is sometimes described as doughy. Amyloid deposits occur along the renal vessels and in the vascular tufts of the glomeruli. This process may progress until the whole organ is infiltrated, the true renal structure undergoing an atrophic degeneration. The amyloid degeneration is usually associated with the same condition in other organs, especially the liver and spleen, and occasionally in the intestinal villi. The situation of the portions of the kidneys affected by the amyloid change can be demonstrated by the iodine and sulphuric acid reaction. This consists in brushing over a section of the affected kidney a solution of iodine with iodide of potassium in water. This will give a reaction of a mahogany color. If, now, diluted sulphuric acid be applied, the color of the cut surface will change to a bluish-violet tint. The aniline violet test consists in brushing over the kidney a one per cent. solution of aniline violet. That portion of the kidney which has undergone amyloid degeneration will show a red or pink reaction, while the unchanged tissues are stained blue.

3. *Chronic Diffuse Nephritis without Exudation.*—In this form the kidneys have undergone a true sclerosis; the whole organ is smaller than normal, the surfaces being nodular and the capsule adherent. Thinning of the cortex occurs, and the color is red or reddish-gray.

The pathologic changes may be in part the same as those in the first variety, with the addition of a great increase of new connective-tissue elements. This increase is distributed in an irregular manner throughout the whole kidney structure. Dilatation of the tubules sufficient to form cysts of varying size occurs in places. At other times the tubules entirely disappear. Atrophy of the glomeruli follows unless chronic congestion has preceded the inflammation. If chronic congestion has preceded the nephritis, the glomeruli may be large and their capillaries dilated; generally, however, they will be seen to have undergone atrophy.

Symptoms.—1. *Chronic Nephritis with Exudation.*—In many cases this form of nephritis will not be recognized until there appears a

slight puffiness under the eyes or occasionally dropsy in some other part of the body. The patient will usually, on examination, be found to have had at some previous time an attack of acute renal inflammation which has never entirely subsided, but which has been unrecognized. The period of intermission since the original attack may have extended for a varying time; possibly a few months or a year or two. In some cases the symptoms of dropsy and anemia follow immediately an acute attack. As the disease progresses, various digestive disturbances are noticed; there may be vomiting, not only after eating, but also when the stomach is empty. The appetite is generally lessened. The bowels are very frequently constipated, although such patients often have short attacks of diarrhea. Anemia is always a prominent symptom. With each exacerbation of the disease various nervous symptoms appear. The patient will complain of violent attacks of headache, neuralgia, sometimes insomnia and great loss of strength. This general group of symptoms is very common, and appears for a certain length of time and then, not infrequently, disappears quite suddenly, the patient in the interval becoming quite comfortable, gaining strength to a certain degree. With each recurrence the symptoms become more marked. Finally dyspnea will develop, the heart becomes irritable, vomiting increases, apparently without cause, the patient complains of vertigo and sometimes of defects in vision. The dropsy, which has previously been slight, may extend over the whole body. Effusions occur into the serous cavities, and the patient may die from pulmonary edema. During the exacerbations of the disease slight attacks of epistaxis not infrequently occur. During each onset the urine is scanty and high-colored, containing casts, in character granular, epithelial, and sometimes fatty or hyaline. Oil globules will often be found. The specific gravity of the urine is low, usually not over 1012 to 1015. The quantity of albumin will vary considerably; between the periods of exacerbation it may be quite small in amount. No matter how well the patient may seem to be between the attacks, some albumin and some tube-casts are almost always present. The urine will, however, be passed in much larger quantities during these intervening periods, but the specific gravity is never so high as that of normal urine.

The amount of urea excreted is below the normal. A certain amount of vesical irritation is quite commonly found. The duration

of this form of nephritis differs according to the surroundings of the patient.

2. *Waxy or amyloid degeneration of the kidneys* is usually accompanied by or associated with the same sort of change in other organs, particularly the liver and spleen. Ascites is a more marked symptom in this form. The urine is generally increased in amount, is yellow in color, of low specific gravity, and will contain albumin and hyaline casts. A profuse watery diarrhea is present, and is particularly marked when the amyloid changes affect the intestinal canal. The peculiar whiteness of the skin known as "alabaster cachexia" is often present.

In both the preceding forms of renal disease death most commonly occurs from acute uremia, pneumonia, peri- or endocarditis, or from pulmonary edema or pleurisy.

3. *The symptoms of chronic interstitial nephritis* in children are the same as in adults. The urine is pale in color and large in quantity. The specific gravity is low, usually between 1002 and 1010. Albumin will be found in very small quantities; frequently it is not present at all for periods of varying length. Dropsy is rare. On the other hand, the arterial tension is generally high and hypertrophy of the left ventricle is usually present. Atheroma of the arteries may be found even in a child as young as six years of age (Dickinson). Nervous phenomena—such as headaches, neuralgia, various disturbances of vision, and dyspnea—are very commonly seen. Death usually occurs from acute uremia, although hemorrhages, especially cerebral hemorrhages, may occur late in the disease.

The **diagnosis** of chronic nephritis in children is based practically on the same facts as similar disease occurring in adults. Holt lays stress on the fact that where children are affected with convulsions, with frequent or persistent headaches, or such conditions as anemia, cardiac hypertrophy, especially with high arterial tension, and in cases of general malnutrition, the urine should be frequently and carefully examined. Where any of the group of symptoms pointing to renal disease manifest themselves, the patient should be kept under observation for a considerable period and the case carefully studied.

Prognosis.—The outlook for complete recovery in any of these forms of nephritis is not favorable. On the other hand, much can be done in the first variety for the comfort of patients and the prolonga-

tion of their lives. There is no doubt that many cases affected with chronic nephritis, especially the exudative variety, live for years, providing they are placed amid comfortable surroundings, are kept absolutely free from worry, and in a climate of reasonably equable temperature, particularly one free from extremes of cold and heat. The prognosis in cases of waxy kidney is about the same as in the preceding form. It is possible that recovery may take place where, in cases resulting from prolonged suppuration of bone, the diseased structure has been removed. The prognosis in the interstitial variety of nephritis is always bad, although the progress of the disease is generally quite slow. The immediate prognosis will depend considerably on the amount of dropsy, the existence of valvular disease of the heart, the amount of urea excreted, and the strength of the general excretory power of the kidneys.

Treatment.—Children affected with chronic nephritis should be placed amid surroundings free from nervous worry and strain of all kinds. It is very important that such children, as soon as the disease is recognized, be kept from school, or at least from hard study. If possible, they should be sent to a dry, warm climate, especially during the winter months. Great care should be exercised that these patients do not take cold. Woolen underclothes should be worn next to the skin at all seasons of the year. While overfatigue is extremely dangerous, yet regular exercise in the open air is of the greatest benefit. They should be dressed warmly in winter, and in summer their clothing so regulated as to allow them as much coolness as possible, yet avoiding any danger of chilling. The general aim of the treatment is to retard the progress of the disease as much as possible, and where symptoms arise, to relieve them. Tonics are nearly always indicated. A good rule to remember in the administration of remedies to these patients is that during the periods of quiescence of the disease as little medicine should be given as possible. While milk is in many respects the best article of diet, yet frequently it can not be borne for a long period of time; it becomes extremely disgusting to some patients and will finally do more harm than good. Sometimes, where milk can not be taken by itself, it can be used on desserts, on fruit, or given in some other way to make it more palatable. Much meat must not be allowed, and salt meats should be prohibited. The lighter soups, fresh fish, oysters, and foods of this description,

may be given in moderation, as also may farinaceous foods and the starchy vegetables. The patient should be encouraged to drink water, and for this purpose many of the mineral waters are recommended, not so much for their own inherent qualities as on account of their being more palatable.

Iron should be prescribed where anemia is a prominent symptom, and where considerable dropsy exists, diuretics, saline laxatives, and calomel in small doses are needed. When the heart is weak this condition will naturally call for cardiac stimulants. The skin should be made to do as much work as possible, thereby easing the crippled kidneys, and with this in view sponge-baths of hot water or occasional vapor baths are useful. Attacks of uremia should be treated in the usual way. If the arterial tension is high and there are convulsions or stupor, blood-letting may be resorted to. In many of these cases nitroglycerin will also be found useful. The hot pack is probably the best means of producing rapid diaphoresis. In cases where the uremic convulsions are marked and are accompanied by dilatation of the pupil, morphin may be administered hypodermically.

PERINEPHRITIS.

Definition.—Perinephritis consists of an inflammation of the cellular tissue surrounding the kidney.

Causes.—In origin it may be primary or secondary. If primary, the cause may be from cold or exposure or traumatism. Occasionally it develops without any known cause. Secondary perinephritis may follow suppurative diseases of the kidney, no matter from what the latter arise.

Pathology.—The perinephritic tissues of both kidneys are affected with equal frequency, and the disease is as common in girls as in boys. It may be found at any age. Where the inflammatory process progresses to the formation of an abscess, the latter usually burrows between the lumbar muscles, and may appear superficially in the posterior part of the body, near the middle of the ileocostal space (Holt). Sometimes it may proceed between the abdominal muscles and point above Poupart's ligament. Occasionally it may appear at the upper and inner aspect of the thigh, or it may rupture into the peritoneal cavity.

Symptoms.—The symptoms of perinephritis are those of acute

inflammation. The attack usually begins with a chill, fever, and pain. The pain is usually felt in the lumbar region, in the groin, along the inner side of the thigh, and in the knee, and is generally increased on moving the leg. Where the disease has existed for some time, a distinct tumor, accompanied by tenderness, may be seen and felt over the region of the kidney on the affected side, and this tenderness may extend to the hip or along the back. As the inflammation proceeds, there may be stiffness in the hip on the affected side. The thigh is flexed and extension will cause resistance and pain. Other movements of the limb, however, are normal. Symptoms referable to the kidneys themselves are not present in all cases. Their presence will depend, to a certain extent, on whether or not these organs share in the inflammation. Sometimes there may be some pain on micturition, and this may be increased in frequency. Where pyelitis exists, the urine will contain pus. The disease may vary greatly as to the length of its duration. Acute cases may run a course of from four to eight weeks. The disease may, however, last for several months.

Diagnosis.—The disease with which perinephritis is most likely to be confounded is *inflammation of the hip-joint*. The two affections, however, have distinct points of difference which will make the diagnosis one of not great difficulty. Perinephritis is a disease of much more intense and rapid onset, and the general symptoms are those of an acute inflammation; whereas in hip-joint disease the condition develops slowly and the constitutional symptoms may be wholly absent during the early stages of the affection. In perinephritis there is interference with the flexion and extension of the thigh, but the other motions are not interfered with; whereas in hip-joint disease all movements of the joint are restricted, and there is also tenderness in the joint itself. The characteristic secondary changes in the thigh which are always present in hip-joint disease are absent in perinephritis. *Psoas abscess* may be mistaken for perinephritis, but in the former we usually have present the symptoms of tubercular disease—its characteristic temperature and very possibly some deformity of the spine may be seen to aid in the diagnosis.

Prognosis is fairly good. The majority of cases recover from this disease.

Treatment.—This should consist in complete rest, and where the case is seen early, counterirritation should be applied over the lum-

bar region, or, in some cases, an ice-bag may give a better result than heat. Poultices sometimes give relief. As soon as the abscess points externally it should be opened to prevent its rupture into the peritoneal cavity.

PYELITIS.

Pyelitis is an inflammation of the mucous membrane lining the pelvis of the kidney. Where a portion of the ureter or of the true kidney structure is involved, the condition is known as pyelonephritis. Where an accumulation of pus exists in the pelvis of the kidney, the condition is known as pyonephrosis.

Causes.—The condition may arise from congenital malformations of the kidneys or ureters; from tuberculosis, or from new growths. It may also be caused by an extension of an inflammation of the surrounding tissues. Extension upward of a septic inflammation of the genito-urinary tract is a very common cause. It not infrequently arises from an irritation produced by a renal calculus. An acute form of the disease may follow an attack of the infectious fevers or of septicemia. Not infrequently nephritis is coexistent.

Pathology.—Pyelitis may affect one or both kidneys. In the acute form the mucous membrane presents the usual appearance of acute catarrhal inflammation; it is congested, swollen, and occasionally small hemorrhages will be found. Where the disease becomes chronic, the mucous membrane is thickened and granular. Accumulations of pus may occur.

Symptoms.—The symptoms will, to a certain extent, depend upon the cause. Where the attack is acute and is produced by a stone or other cause of direct renal irritation, there may be chills, pain, fever, and attacks of renal colic. Where the cause is tuberculosis or abscess in the kidney, there will be recurring chills, fever, and sweats, and some pain. The patient will suffer progressive loss of flesh, and present the general appearance of deteriorated health. The quantity of urine is usually somewhat diminished. Its reaction is acid; albumin, pus, and blood-cells are found in it. Granular, epithelial casts, and bacteria are generally present.

The **diagnosis** can be made from the symptoms and from examination of the urine. In differentiating this condition from cystitis, it should be remembered that the urine is less apt to be acid in reaction

in inflammation of the bladder, and in the latter condition the quantity of pus will be much less. The presence of tube-casts and of renal epithelial cells, as well as the more severe general symptoms, will generally be sufficient to prove the diagnosis.

Treatment.—The patient should be placed on a fluid diet, and where the urine is irritating by reason of its high degree of acidity, the latter should be neutralized by the administration of citrate of potassium or by free administration of water. Counterirritation over the lumbar region by the use of dry cups, poultices, or mustard plasters should be employed. Where pyonephrosis exists, the question of surgical interference must be considered. If only one kidney be affected, its removal promises a chance of recovery; but usually both organs are involved.

RENAL CALCULI.

Renal calculi may be formed at any period of life. The stones may vary in size very considerably. They are usually found in the pelvis and calices of the kidney, and are composed of uric acid. When very small, they may be seen as small granular deposits in the pelvis of the kidney.

Symptoms.—When the deposits are small, they may be excreted through the pelvis of the kidney and ureter without producing any symptoms. When large, however, their passage generally causes the condition known as renal colic. The patient is suddenly seized with intense pain and tenderness over the affected kidney. The pain soon radiates around the affected side diagonally across the abdomen to the region of the bladder. There may be pain in the perineum, and in boys the testicle on the affected side is retracted. Sometimes the pain may even radiate to the opposite side of the body. The attack will continue at intervals until the stone has reached the bladder, when it usually ceases suddenly. During the attack, and for a short time afterward, the urine may contain traces of blood and some albumin. Where pyelitis has been produced by the irritation of the stone, the symptoms of this condition will be present, and the urine will contain pus and epithelial cells from the pelvis of the kidney. In some cases the pain is so great as to produce collapse. Where the stone becomes impacted in the upper part of the ureter, hydronephrosis or pyonephrosis occurs.

The **treatment** of renal calculi in children is the same as in the adult.

TUBERCULOSIS OF THE KIDNEY.

Tubercular affection of the kidney usually occurs as a secondary complication of general tubercular disease. The source of infection is usually in the blood, and very rarely the extension of tubercular disease from the bladder. It is stated that the disease usually begins in the pelvis and calices of the kidney. Later the pyramids and cortex become involved. As a rule, only one of the kidneys is affected. Not infrequently a tubercular perinephritic abscess will coexist.

Symptoms.—These, in many cases, are obscure. They usually consist in pain and tenderness in the region of the kidney, and possibly some swelling; the latter is particularly the case if perinephritis exists. Irritability of the bladder is generally present. The urine is decreased in amount and contains pus. A sure point of diagnosis would be the recognition of the tubercle bacillus in the urine. Renal tuberculosis is most commonly seen in children between two and twelve years of age, although it may be found at any period of life.

The **treatment** is purely surgical, and consists in removing the organ.

TUMORS OF THE KIDNEY.

Tumors of the kidney in childhood may be benign or malignant. The former are very rare. Aldibert has reported three cases: one each of adenoma, fibroma, and fibrocystic tumor. These tumors can be recognized by their slow growth and by their mild constitutional symptoms. The most common forms of malignant tumors of the kidney occurring in children are sarcoma and carcinoma, the former being most frequently seen. They are usually primary growths, and rarely occur in children under five years of age. After this time, however, they are by no means a rare form of abdominal neoplasm.

Pathology.—The type of sarcoma is usually round- or spindle-celled, but myosarcoma is sometimes seen. They may grow from the cortex or from the pelvis of the kidney, and sometimes from the adrenals. Infiltration of the whole organ may take place even to such an extent as to destroy the entire renal structure. Metastasis may occur in the opposite kidney, lungs, or other neighboring structures. Hydronephrosis due to pressure upon the ureter, or serious complications, such as thrombosis, from pressure upon the vena cava,

may take place. As the tumor grows, it becomes adherent to the surrounding organs. Ascites and general peritonitis may appear in the later stages. In size, the tumor may reach very considerable proportions. According to Holt the weight may be as high as fifteen pounds, and he states that one case has been reported by Jacobi in which the tumor weighed thirty-six pounds. The right kidney is rather more frequently involved than the left.

Symptoms and Diagnosis.—The principal symptoms are a rapidly growing tumor, with progressive emaciation and cachexia. Pain may be present, but not infrequently it is slight or may be entirely absent. In the majority of cases the tumor first appears in the lumbar region, but its growth is usually forward toward the median line. The increase in size is rapid. In shape it is irregularly rounded or nodular, and without a well-marked border. The urine may at intervals contain blood, pus, or albumin. Sometimes this does not occur until late in the disease.

The **diagnosis** will be made from the rapid growth of the tumor, its solid character, and from the fact that it is freely movable with its attachment near the lumbar spine (Holt). The rapid failure in the patient's general health, the presence of blood, pus, and albumin in the urine will all aid in the diagnosis.

The **prognosis** is unfavorable.

The **treatment** should be by operative means.

CHAPTER XI.

DISEASES OF THE GENITAL ORGANS.

ORCHITIS.

Inflammation of the testicle is seldom seen in childhood, except as the result of traumatism. It may rarely follow an attack of mumps, but in childhood this is much less frequent than in the adult. Not infrequently orchitis is accompanied by hydrocele.

The **treatment** should consist in supporting the testicle by means of a suitable bandage or pads of cotton and the local application of lead-water and laudanum.

TUBERCULAR DISEASE OF THE TESTICLE.

Tubercular disease of the testicle is rarer in infancy and childhood than in adult life. When present, the testicle will be found considerably swollen, nodular, and not very tender. As the disease progresses, adhesions may form between the testicle and the scrotum. The glands may break down late in the disease and suppuration occur. Tubercular disease of the testicle is found in two forms: (1) As secondary to a general tubercular infection, or (2) as a part of a localized tuberculosis of the genito-urinary tract.

Treatment.—Where the diseased condition of the testicles is a part of a general tuberculosis, the orchitis should be treated symptomatically and attention paid to the general tubercular infection, the treatment of which is considered in the chapter on Tuberculosis. In all cases of tubercular disease of the testes castration should be performed; especially should this be done to young children. There is always a danger of general systemic infection resulting from the diseased testicle.

EPIDIDYMITIS.

Inflammation of the epididymis may be caused by traumatism or by continuation of irritation of the urethral mucous membrane. The epididymis will be found considerably enlarged and very tender, and by its swelling it will push the testicle forward. The spermatic cord is often inflamed, enlarged, and extremely painful on pressure. It is not uncommon to find the whole scrotum swollen and very painful.

The **treatment** should consist of absolute rest, the patient lying on his back. The bowels should be kept open. Local applications in the form of hot poultices or lead-water and laudanum should be made to the scrotum. The scrotum should always be supported in this as in all forms of inflammation of this region. Rotch recommends that the testicle be always placed in such a position that the lower end of the gland points upward.

HYDROCELE.

This condition is not at all uncommon in children, being quite frequently met with in the early years of life. It may result from a variety of causes, sometimes arising from traumatism, as by pressure. It may in some instances result from simple irritation. Occasionally it is congenital. The form known as infantile hydrocele is really a condition where the tunica vaginalis and funicular process are distended with fluid, the processes being closed at the internal abdominal ring. The funicular part of the process may remain open and be shut off from the tunica vaginalis.

In the third variety there may be an encysted hydrocele of the cord due to distention of an unclosed segment of the funicular process.

Diagnosis.—The condition with which it is most likely to be confused is scrotal hernia, the diagnosis of which has been given under the head of Hernia.

Treatment.—Where the hydrocele is capable of reduction, it should be treated by a truss in the same manner as hernia, an effort being made to close the neck of the canal.

In all forms of irreducible hydrocele the treatment is by evacuation of the fluid by means of a small trocar and cannula under antiseptic

precautions. If this is unsuccessful, Rotch advises that the sac be extirpated or a weak solution of iodine should be injected. When a cure is not effected by means of simple evacuation, the sac should be laid open, the cavity packed with iodoform gauze, the strictest antiseptic precautions being followed, and the wound allowed to heal by granulation. If the sac be large, a small portion of its walls on each side of the incision should be cut away. This is a perfectly safe and rapid method of radical cure of this condition.

Hydrocele in Female Children.—Although hydrocele is much rarer in female than in male children, yet it sometimes occurs. It consists in a collection of fluid in the tube-like pouch of the peritoneum, which accompanies the round ligament through the inguinal canal and is known by the name of the canal of Nuck. Occasionally the exudation of fluid may take place in the tissues of the round ligament itself or in the labium majora, external to the covering of the round ligament.

The symptoms will be the appearance of a tumor in the labia or in the inguinal region. Fluctuation will be obtained in this tumor. It will also be translucent. Appearing in girls at the age of puberty, it might possibly be confounded with a cyst or abscess of the vulvo-vaginal gland, but the lack of inflammatory symptoms would aid in the diagnosis. Pudendal hernia would be excluded by the fact that in hydrocele there is no impulse on coughing, and the other symptoms of hernia are absent.

The **treatment** is the same as that of hydrocele in male children.

Varicocele is a very rare affection in childhood. Ashby and Wright claim they have never seen it earlier than the tenth year.

Treatment will be the same as that for the same affection in adults.

Ovarian tumors in children are exceedingly rare. When found, they are usually dermoid cysts, carcinomata, or teratomata (Ashby and Wright).

The **treatment** of these would be the same as in the adult.

UNDESCENDED TESTICLE.

Ordinarily the testes descend into the scrotum during the eighth month of intra-uterine life, but, occasionally, children are born with the glands still within the abdominal ring. In cases where a year or

two has elapsed without the descent of the testicles, it is quite possible that atrophy may take place. It sometimes happens that one or both of the testicles will descend and return to the abdominal cavity again.

In any of these cases the testicle should be brought into the scrotum and retained there by a proper truss; operative measures for bringing down the testicle may have to be resorted to.

Operation for Undescended Testicle.—When the testicle can not be pushed down into the scrotum and held in place by a properly-fitting truss, the testicle and cord should be exposed by an incision sufficiently long to open the scrotum, and traction should then be made on the cord. In this way the testicle can frequently be brought down into the scrotum and sutured in place by stout catgut. The tissues of the scrotum should then be united over the testicle by buried sutures of catgut; this aids materially in keeping it in place.

The internal inguinal ring is, as a rule, open, and frequently a hernia is present. The inguinal canal should therefore be slit up, the cord transplanted, as in Bassini's method for the radical cure of hernia, and the tissues united by kangaroo tendon sutures.

In fact, it is an operation for the radical cure of hernia, plus the pulling downward and anchoring of the testicle in the scrotum.

TORSION OF THE SPERMATIC CORD.

Occasionally one of the testes is twisted upon the cord sufficiently to cause constriction of the circulation, and even gangrene. This generally happens in an undescended or partially descended testicle.

It is very difficult to differentiate between this condition and a strangulated hernia.

An operation must be performed, the cord untwisted if possible, or, if there be any doubt as to the vitality of the tissues, the testicle and cord must be excised.

HYPOSPADIAS.

The condition known as hypospadias is the result of arrested development in the urethra and corpus spongiosum. Normally, the urethral groove should, by the uniting of its sides, be converted into a canal. This process of union begins at the base and extends to the end of the penis, and arrest of this process of development may cause the

urethra to open at any point along the inferior margin of the penis. In female children the bladder usually opens directly into the vestibule.

EPISPADIAS.

In males this variety of malformation is produced by the urethral canal opening upon the dorsum of the penis. It is very commonly associated with extroversion of the bladder. Occasionally there is a defect in the union of the anterior abdominal wall and a cleft in the symphysis pubis. In female children the anterior wall of the urethra is absent. The nymphæ and clitoris are generally split.

The **treatment** should be by surgical means.

CHAPTER XII.

DISEASES OF THE BLOOD.

Clinical Methods for the Examination of the Blood.—The instruments used in the inspection of the blood are the microscope, the hemocytometer, the hemoglobinometer, the hematocrit, and the spectroscope. Of these, the microscope used alone to investigate a freshly drawn specimen of the blood upon a plain cover-glass has its usefulness limited to the detection of foreign bodies, such as bacteria and the like. For estimating the number of blood-corpuscles in a definite quantity of diluted blood, the Thoma-Zeiss hemocytometer has proven the most satisfactory of any of the instruments devised for this purpose. This instrument consists of: (1) A graduated capillary pipet with an ampulla or dilatation in its upper third, this small dilatation contains a glass bead which moves freely within it; (2) a graduated microscopic slide. The pipet is marked at three points, namely, .05, 1, and 101. The field of the slide is divided into sixteen larger squares, each containing sixteen smaller squares. Each of the small squares is $\frac{1}{20} + \frac{1}{20}$ of a mm., or $\frac{1}{400}$ of the square mm., and the cell is $\frac{1}{10}$ of a mm. deep; therefore, the capacity of each small square equals $\frac{1}{4000}$ of a c.mm. For diluting the blood, Daland highly recommends a 2½ per cent. solution of bichromate of potassium in estimating the red blood-cells, and states, as an advantage, that (a) the fluid fixes the shape and color of the red cells and (b) prevents coagulations and the formation of rouleaux. A simple solution of sodium chlorid will answer the purpose and is recommended on account of its easy preparation.

Method of Testing.—The lobe of the ear or the finger-tip may be selected as the point from which to obtain the blood, and after washing the parts carefully with soap and water, then with alcohol and ether, the blood should be drawn with Cook's superficial thrust, using a sharp, flat-bladed knife, such as a tenotome. The first drop of blood should be wiped off and then the point of the pipet placed in the

next drop exuded, and, by aspiration, the blood is sucked up to the point marked 1. Next, wipe off the excess, and, placing the pipet in the bichromate solution, fill to the point marked 101; mix the blood and solution thoroughly by shaking the tube one minute. Then blow out the last portion of the fluid sucked up and place a small drop of the blood mixture upon the graduated slide; a cover-glass should then be gently slid upon the drop and the graduated slide placed under the microscope. In calculating the number of corpuscles to the c. mm. we find that, as the capacity of each small square on the slide equals $\frac{1}{1000}$ of a c. mm., the average number of corpuscles multiplied by 4000 therefore gives the number of corpuscles in the one c. mm. of diluted blood. Now, multiply the product by 100 or 200, according to dilution, and the result will represent the number of corpuscles in the undiluted blood. A rule to be observed in counting is that all corpuscles touching the right border and base-line of a square belong to that square. The method for estimating the number of white corpuscles is essentially the same as that employed in counting the red blood-cells, but with these exceptions: first, a special pipet is used in which a dilution of 1:20 or 1:10 is obtained. Also a $\frac{3}{10}$ per cent. solution of acetic acid is used instead of the bichromate of potash solution, because the acid destroys the red blood-corpuscles, they being thus eliminated from the field. For the calculation of the number of white blood-cells, Thoma's method is generally employed. Hemoglobin is estimated by means of the hemometer, or hemoglobinometer. Fleischl's instrument, notwithstanding the inaccuracies associated with it, has a preference among clinicians, and on the whole gives satisfaction. Fleischl's hemoglobinometer consists of four parts: (1) A metallic stand with a thumb-screw and porcelain reflector; (2) a cylinder with a glass bottom; this cylinder is divided into two chambers by a perpendicular partition or diaphragm; (3) a framework graduated from 0 to 120 and holding a wedge-shaped piece of red glass representing the standard color of the blood at different dilutions, the glass being thicker at the darker end; (4) a small capillary pipet set on a platinum handle. In using this instrument, fill both chambers of the cylinder equally with distilled water; the surface of the water should come within a short distance of the end. The pipet being filled with blood from the patient's finger, it should be agitated in one of the chambers of the cylinder until all the blood has been shaken out

of the pipet. Complete the filling of both chambers with distilled water, then put the cylinder in place on the metallic stand and in a dark room, by candle-light, turn the thumb-screw until the intensity of color reflected from the red glass through the distilled water is identical with the blood mixture. The number then indicated on the metallic stand will give the percentage of hemoglobin. For the determination of the volume of the corpuscles, Blix-Hedin devised the hematocrit, which, by centrifugal force, collects the corpuscles in the distal end of a graduated capillary tube. The instrument consists of a series of cogwheels which transmit by means of a screw thread, or, as in the instrument improved by Daland, a cogwheel giving a rotary motion to a horizontal framework holding a graduated capillary tube divided into fifty parts. In the graduated capillary tube are placed equal volumes of blood and bichromate of potassium solution of $2\frac{1}{2}$ per cent. strength. One hundred revolutions of the hand-wheel produce 1000 revolutions of the horizontal frame and by centrifugal force the corpuscles are precipitated to the distal end of the capillary tube. Two minutes suffice to produce sedimentation. The red corpuscles having a higher specific gravity occupy the farthest end of the tube. By means of the scale on the graduated capillary tube the number of volumes of red blood-cells is read off, which, multiplied by two for the dilution and again by two because only fifty volumes are used, gives, as a result, the number of red corpuscles in 100 parts of the blood. By the spectroscope the condition of the hemoglobin in the blood is determined. By this means the normal oxyhemoglobin may be differentiated from methemoglobin or the condition produced by a number of blood poisons.

General Pathologic Changes.—In times past the blood was considered, pathologically, solely from the clinical evidences of an increased or diminished quantity of the fluid in relation to the body weight. But little reference was paid to quality or to the condition of the various constituents. Plethora was described as a condition in which there existed an excessive quantity of blood, and while it seems evident that a transient increase in the total amount of the blood is a possibility, yet the condition is mostly relative, and the symptoms observed are the result of vasomotor disturbances. The opposite condition to plethora was indicated in the term anemia, which represented, in a general way, an impoverished state of the blood. Modern inves-

tigation has modified this term so as to describe more accurately the pathologic conditions of its affected component parts; thus, where there is an actual reduction in the volume of the blood without reference to quality, the term oligemia is applied, while alterations in quality—that is, a reduction in the number of red blood-corpuscles, or in the percentage of hemoglobin—have been termed oligocythemia and oligochromemia, respectively. The watery constituent of the blood may be increased or diminished, and the term hydremia is applied to the former and anhydremia to the latter. Lipemia is a term used to describe a superabundance of fat in the blood, and is often met with in cases of pulmonary tuberculosis, diabetes, chronic nephritis, and alcoholism. The term melanemia refers to the appearance of dark granular pigment in the blood. It is symptomatic of certain infectious fevers, notably malaria and relapsing fever. Transient increase in the white blood-corpuscles is commonly met with, and occurs as a physiologic as well as a pathologic phenomenon. This temporary, or sometimes permanent, condition in which the polymorphous neutrophils are involved has been termed leukocytosis, in contradistinction to leukemia, in which the increase of cells is essential and constantly affecting the mononuclear leukocytes. In its pathology and etiology leukocytosis is essentially the result of chemotactic influences, and may be said to exist when the number of leukocytes exceeds 10,000 to the cubic millimeter. It is met with physiologically in pregnancy, in the new-born, and during the function of digestion. Pathologically, it is caused by most of the inflammatory and infectious diseases, neoplasms, and a number of drugs. It occurs after hemorrhage, and is seen in a number of cachectic conditions, principally those of rachitis and syphilis. Cold bathing and massage conduce to the increase of the leukocytes. Leukocytosis is of itself of little clinical importance, but it must be remembered that, as a rule, an increase in the number of leukocytes never occurs in typhoid fever, influenza, malaria, tuberculosis, and lepra, and that the absence of the condition in croupous pneumonia is generally of grave prognostic significance.

ANEMIA.

Anemia may be classified into: (1) Primary or essential anemia, in which the clinical manifestations of the disease predominate in the

blood or blood-making organs; to this class belong chlorosis, leukemia, progressive pernicious anemia, and Hodgkin's disease; (2) symptomatic or secondary anemias. This division embraces those anemic conditions which are the result of various diseases, the anemic symptoms being secondary and subordinate to the pathologic lesion.

PRIMARY ANEMIAS.

CHLOROSIS.

Synonyms: CHILOREMIA, GREEN SICKNESS.

Definition.—Chlorosis is an essential anemia occurring chiefly in young girls at about the period of adolescence. It is characterized by a diminution in the percentage of hemoglobin, the evidences of anemia and changes in the vascular system.

Causes.—Among the predisposing factors which are potent in the causation of this disease, sex stands preëminent. Chlorosis seems to be confined chiefly to the female sex, and is rarely seen in other than ill-nourished girls about the age of puberty, although cases have been reported in females before reaching this period by Nonat and others. Heredity undoubtedly plays an important part as a predisposing cause. The statement that light-haired girls and girls of poor vitality are especially predisposed has been generally refuted, although the question is still unsettled. The causes which may be directly responsible for the development of the disease are, on one hand, overwork and poor nourishment, and, on the other, indolence, vicious habits, and bad sanitation. Powerful nervous impressions may act as strong influences in the development of the disease.

Pathology.—Many have looked upon chlorosis as dependent upon disturbances of menstruation, and not a few have held to the theory that gastro-intestinal disorders are the cause of this disease. These theories are easily disproved. So far the causative lesion has not been demonstrated, but the consensus of opinion is that chlorosis is dependent upon imperfect hemogenesis.

Anatomic Changes.—The heart and blood-vessels in chlorosis are in a state of hypoplasia. Fatty degeneration of the cardiac muscle and arterial coats has frequently been demonstrated. The same condition of hypoplasia is often seen in the genital organs, they fre-

quently presenting an infantile appearance. While any or all of the above changes may be noted, they are by no means constant.

Blood Changes.—The blood presents a pale, watery appearance with a seeming loss of consistency. The most noticeable change, however, in the blood is the reduction in hemoglobin percentage, this decrease being out of all proportion to the reduction in the number of red blood-corpuscles. The loss of hemoglobin will reach 40 to 50 per cent. The specific gravity of the blood is also proportionately reduced. The red corpuscles are pale and show less tendency to form rouleaux. Microcytes and megalocytes are at times found in abundance, and corpuscles of irregular outline (poikilocytes) are constantly present. The blood plaques are invariably increased in number, while the white blood-cells remain about normal.

Symptoms.—The premonitory symptoms of the disease are varied, sometimes being rather vague. Frequently they are unnoticed, except that the girl, before in good health, develops a gradual increase in lassitude, which is often attributed to the onset of puberty or overwork. Later, the menstrual periods are apt to be interrupted and irregular in time. Shortness of breath and palpitation of the heart are frequently complained of. Headache is common, in fact, in some cases may be almost constant. Dizziness and weakness, increased upon standing and walking, are very common. The digestion becomes weak, the appetite fails, and the patient will often crave abnormal articles of food. The skin develops a peculiar greenish-yellow tint which is eminently characteristic of the disease. The mucous membranes are pale and the conjunctivæ in severe cases almost colorless. In some cases the cheeks and lips retain their natural color, even though the hemoglobin shows a pronounced reduction. To this class of cases Wendt has applied the name of chlorosis florida or chlorosis rubra. Occasionally marked pigmentation is observed in the neighborhood of the joints. Edema beneath the eyes and of the maleoli is commonly complained of and is more apt to be met with toward the end of the day than in the morning. There is a tendency to the accumulation of fat, making the patient, as a rule, rather flabby than emaciated. The disturbances of circulation are generally manifest by visible pulsations of the veins of the neck. Coldness of the extremities and palpitation of the heart are very frequently complained of. The pulse is generally rapid and weak. Examination of the heart seldom

reveals any change in size. The apex beat is usually visible and strong; hemic murmurs are heard upon auscultation, most frequently over the pulmonary area, and at times a soft systolic bruit may be elicited at the apex. Not infrequently a hemic murmur will be heard over the right jugular vein. This is sometimes known as the *bruit de diable*, or humming-top murmur. Hemorrhages are not uncommon and may be due to degeneration of the arterial coats or to the blood itself. The nervous symptoms are many and varied; cephalalgia and neuralgia are rarely absent, while hysteric manifestations of a varied and sometimes grave character are not at all uncommon. Optic neuritis and neuroretinitis have been recorded as symptoms by Gowers.

Complications.—A large number of cases present no complications. Occasionally, however, endocarditis and enlargement of the thyroid gland are seen. Thrombosis of the veins was first observed by Trousseau, and occurs more frequently than is generally supposed. Gastric ulcer, nephritis, and phthisis are frequent complications of the disease.

Diagnosis.—The characteristic greenish tint of the skin, the menstrual irregularity, the gastric, cardiac, and nervous disturbances, together with the examination of the blood, will generally offer a conclusive diagnosis.

Prognosis.—The prognosis of chlorosis is mostly favorable. There are cases, however, which tenaciously resist treatment, but these are exceptions rather than the rule. Chlorosis is generally amenable to treatment in from six to eight weeks, but sometimes is most obstinate.

Treatment.—In chlorosis as well as in the various symptomatic anemias, particular attention should be paid to the environment of the patient. In many cases the rest-cure, or one of its modifications, will be found necessary. This method of treatment is particularly applicable to those patients whose lives have been spent at hard work in a close atmosphere. For those whose means will allow it a sea voyage is to be recommended, and in cases where this luxury can not be had, quiet recreation in a neighboring park or several hours spent in the sunshine in a public square should be insisted upon. Medicinally, iron can be claimed as a specific in the disease, and of all the forms of iron which we have at our command Bland's pills, containing equal parts of the dry sulphate of iron and the carbonate of potassium, have probably given the most satisfaction. Where, for any

reason, pills can not be taken by the patient, some liquid preparation of iron may be used. The tincture of the chlorid will often be found to be extremely beneficial. Da Costa states that the occasional use of the ferrous manganese citrate has given satisfactory results. During a long course of iron constipation will sooner or later result, and, therefore, the administration of the drug should be so regulated as to avoid this objectionable feature. The natural iron waters are here of special use. Constipation can generally be overcome by the occasional use of small doses of epsom or rochelle salts, or a seidlitz powder or bowel irrigation. Next in efficacy to iron in the treatment of chlorosis must be mentioned arsenic. The good results of the latter are much increased in many cases by combining it with iron. Arsenic may be given in increasing doses until a decided physiologic action on the blood is obtained. In most cases massage will be found an admirable adjunct in the treatment.

LEUKOCYTHEMIA.

Synonyms.—LEUKEMIA ; WHITE BLOOD ; ANEMIA SPLENICA.

Definition.—Leukocythemia is a primary or essential anemia, characterized by excessive increase in white blood-cells and by an enlargement of the spleen or lymphatic glands, with changes in the bone-marrow.

Causes.—Leukocythemia may occur at any period of life from infancy to old age, and, although comparatively a rare disease, it is as common among the rich as the poor.

Among the predisposing causes, heredity has commanded considerable attention. Instances are recorded bearing proof of the importance of this factor in the development of the disease. Leukemia has been frequently met with after severe attacks of malaria. However, the latter disease is looked upon as a predisposing rather than an exciting cause. Syphilis rachitis, typhoid fever, and severe hemorrhages have all been mentioned as predisposing causes. The exciting cause of the disease has not yet been determined.

Pathologic Anatomy.—Leukemia is essentially a disease of hemogenic alterations in the blood-making organs. The lymphatic structures are principally involved, and pathologic lesions are noted in the spleen and bone-marrow. From this fact three varieties of the

disease have been described, namely: (1) Splenic leukemia or lienal leukemia, in which the organ is greatly enlarged, deeply congested, and infiltrated with leukocytes. The parenchyma presents a dull reddish appearance while the cortex is light in color. Small areas of fatty degeneration have been noted, and inflammatory adhesions to neighboring structures are not uncommon; (2) lymphatic anemia, in which the lymphatic glands are the seat of hyperplasia. The cervical glands are most frequently involved, but any of the other groups of lymphatics may be affected; (3) myelogenic leukemia, in which the bone-marrow, especially that of the tibia, ribs, sternum, or vertebra present various stages of congestion and degeneration.

The color of the bone-marrow ranges from yellow to a deep-red tint, varying according to the degree of leukocytic infiltration. The fat-cells degenerate and disappear, and at times the evidences of hemorrhage have been noted. The lymphatics of all the structures of the body are more or less affected. The liver is almost invariably enlarged, and is constantly so in cases of the splenic variety. Skin lesions are most constant in leukemia, occurring in macular or pustular patches and developing into small nodules which may ulcerate. The tissues show fatty degeneration.

The Blood in Leukemia.—An examination of the blood in leukemia reveals pathologic changes affecting the white blood-corpuscles, and these changes are eminently characteristic of the disease. The specific gravity is greatly diminished and the blood is lighter in color and more fluid than normal. The changes which take place and the enormous increase in the number of leukocytes are pathognomonic. The number of leukocytes per cubic millimeter may reach anywhere from 100,000 to 1,000,000, so that instead of the normal relationship of white cells to red of 1 : 1000, we often find the ratio of 1 : 20, or even 1 : 1. In some cases the blood is found to contain two leukocytes to one red blood-corpuscle. According to the variety of leukemia considered in the pathology, certain forms of leukocytes have been found to be increased in size: thus the leukocytes are especially abundant in the lymphatic variety, while in the splenic form of the disease and especially in the lienomedullary type the large mononuclear leukocytes are most in evidence. What has been considered a pathologic leukocyte or the myelocytes are rarely absent in leukemia and has been considered by some, especially Erlich, as containing the

utmost significance in the diagnosis of leukemia. These cells are five or six times the diameter of a red blood-corpuscle and contain neutrophilic granules. The eosinophilic leukocytes may or may not be increased in numbers, while the polymorphous or polynuclear leukocytes show a tendency to decrease numerically. The red blood-corpuscles are not, as a rule, affected, or, if at all, they are more apt to be increased than diminished in numbers. Charcot's crystals are found in the inspissated blood of leukemia, and are abundantly seen in the yellowish variety of bone-marrow (Newmann). The urine does not greatly differ from normal, save in the fact that uric acid is invariably increased and the color is a little lighter than in health.

Symptoms.—Leukemia usually comes on so insidiously that the patient does not become aware of his condition until the disease is fairly well developed. The early symptoms are those of a developing anemia, with its attending phenomena of weakness, cardiac palpitation, shortness of breath, and pallor, together with hemorrhages from the mucous membranes. Pain in the splenic area not infrequently ushers in the attack. Priapism has been cited by Edes and others as an early symptom of the disease. The abdomen soon becomes noticeably increased in size, due to the enlargement of the spleen and various lymphatic structures. There is considerable fluctuation in the size of the spleen; examination may show the organ to be hypertrophied to such an extent as to reach the spines of the ilia, while a subsequent examination, after a lapse of some hours, may reveal the organ decreased to one-half of its former size. The involvement of the lymphatic glands, especially those of the neck, is very frequently found. These glands are of stony hardness, and apt to produce pressure symptoms, impeding respiration. Vertigo is constant, and is generally caused by the intense anemia. The skin is of a pale, ashen color; sometimes it has a dirty yellow hue, but, as in chlorosis, the patient may preserve the healthy hue of the cheeks, which appears very deceptive. Various skin lesions, as noted in the pathology, are apt to develop, and subcutaneous edema is rarely absent. The pulse is quick and compressible; hemic murmurs are heard at the base of the heart and in the vessels of the neck. The circulatory disturbances are simply those of intense anemia. The liver is nearly always found to be enlarged, and gastro-intestinal symptoms are common. Diarrhea and vomiting are occasionally met with. The tendency to hemorrhage is a marked fea-

ture of the disease, and cases are recorded in which the loss of blood in a single flow has been such as to endanger the life of the patient. Nervous symptoms, as a rule, are not well marked; of these, headache and melancholia are the most constant.

Diagnosis.—The diagnosis of leukemia is often surrounded with great difficulty. Hodgkin's disease and leukocytosis are apt to be confounded with it. Hodgkin's disease is ordinarily to be distinguished by the fewer number of leukocytes, but during the remissions of leukemia the differentiation can scarcely be made. Leukocytosis differs from leukemia in the fact that the increase of the leukocytes is but a transient condition, is more easily traceable to a definite cause, and the polynuclear cells are affected, whereas the large mononuclear leukocytes are especially involved in leukocythemia. Typhoid fever may be differentiated from leukemia by the almost invariable absence of a leukocytosis. Moreover, the early history of the disease is at variance with that of leukemia. Frequent examination of the blood in a suspected case is the only means by which a positive diagnosis can be made.

Prognosis.—The course of the disease is chronic, and the prognosis is extremely grave, if not fatal.

Treatment.—Notwithstanding the grave outlook for the sufferer from leukemia every effort should be made to persist in treatment in the hope of a chance of recovery. The patient should have absolute rest, and this is of primary importance. His personal hygiene should be carefully attended to; an easily digested diet should be given, attention being directed to the quantity of food given at each meal. Arsenic has proven by far the most valuable of all drugs recommended in the treatment of this disease. Fowler's solution in increasing doses is perhaps the most efficient method of administering the drug. Quinin, iron, and strychnin prove valuable only as general tonics. Symptoms should be treated as they arise. In regard to the removal of the large, painful spleen, the operation of splenectomy has proved disastrous in every case save the first, and is therefore unjustifiable.

PROGRESSIVE PERNICIOUS ANEMIA.

Definition.—A grave progressive form of anemia, dependent upon hemolytic disturbances, characterized by the presence of abnormalities

of and a great reduction in the number of red corpuscles without a corresponding loss of hemoglobin.

Causes.—The true cause of the disease is unknown. It has been asserted that ptomains absorbed from the alimentary canal were instrumental in its etiology. This, as well as the infectious theory, have not been substantiated. Pernicious anemia usually occurs in middle life, but occasionally may be seen in children. It is, however, rare in the early years of life.

Morbid Anatomy.—The skin presents a pallid, yellowish cast, and this pallor may be shared by the mucous membranes. The muscles in contrast to the external organs are markedly red in color. A considerable amount of serous effusion is occasionally met with, especially in the pleural and pericardial sacs. Patches of ecchymoses are frequently observed upon the skin, the mucous and serous membranes, and upon various organs of the body. Small hemorrhagic extravasations are frequently met with upon the retina in the neighborhood of the optic disc. Fatty degeneration of the heart is most constant. The appearance of the endocardium is particularly striking. It is caused by a degeneration, and, from the peculiar mottled appearance, has been determined "tabby mottling." The lungs, as well as the spleen, present no constant pathologic lesions. The liver is not infrequently enlarged, is pale, and shows evidences of fatty degeneration. Of special interest is the deposition of iron pigment in the liver. The cause of this pigmentation has not been determined definitely. Many observers have attached special significance to the condition of fatty degeneration and hypoplasia of the connective tissues found in the stomach, but this condition may generally be looked upon as the result rather than the cause of the disease. The pancreas and kidneys are usually softer and larger than normal, and show evidences of fatty degeneration. The changes observed in the bone-marrow are those common to other forms of anemia. The color varies from the yellowish hue of healthy marrow to the reddish color seen frequently during fetal life. Marked degeneration has been seen in the posterior columns of the spinal cord, the cervical region being most markedly affected.

Blood Changes.—A study of the blood microscopically will reveal most important changes. Its color is of a reddish-pink hue, markedly in contrast with that of leukemia, which is generally light in

color, although it may occasionally be dark. The reduction in the number of red blood-corpuscles is a striking feature in the blood of pernicious anemia. This condition of oligocythemia will reach as low as 1,000,000, or 800,000 per c.mm. There is some reduction of hemoglobin, but not in proportion to the lessening in the number of red blood-corpuscles. The amount of hemoglobin contained in each red blood-corpuscle is found to be sometimes twice as much as the normal. In addition to the above changes, we find abnormalities in the red cells, and the giant cells, or megalocytes, are strikingly in evidence; small, oftentimes minute, red blood-corpuscles, or microcytes, are invariably present, but vary as to numbers; irregular corpuscles, or poikilocytes, are scattered over the entire area, and occasionally are observed possessing ameboid movement. Nucleated red blood-corpuscles, known as erythroblasts, are constantly met with, and are of grave significance, indicating the degree of severity of the disease. The blood retains its alkalinity, but tends to become exceedingly hydremic.

Symptoms.—The name “progressive pernicious anemia” expresses the clinical conditions of the disease. Beginning with a slight systemic disturbance, the disease progresses with more or less rapidity to a fatal termination. Increasing languor denotes the development of the affection. Oftentimes there is an early rise of temperature with marked irregularities. Shortness of breath and vertigo are constantly complained of, and there is a great tendency to attacks of syncope. As the disease progresses, extreme weakness confines the patient to bed. The skin presents a lemon-yellow color and is harsh and dry. Palpitation of the heart is always present and becomes marked upon the slightest exertion. Endocardial murmurs are rarely absent, and the apex beat is usually displaced considerably. The heart-sounds, although strong at first, rapidly become weak and muffled, showing evidence of fatty degeneration in the heart-muscle. The pulse is short and weak and a venous murmur is readily elicited in the vessels of the neck. Patients affected with pernicious anemia, as a rule, show little tendency to emaciation; on the contrary, the body is flabby but reasonably well rounded. The bodily strength rapidly decreases, showing marked muscular degeneration. Patches of ecchymoses are often observed in the skin and mucous membranes, and edema of the extremities is most constant. The appetite is soon lost

and digestive disturbances are very often present. As the disease progresses, hemorrhages frequently occur without seeming provocation, and blindness due to extravasations near the optic disc has often been observed. There are no nervous symptoms peculiar to the disease; those present result from the aggravated condition of anemia.

Diagnosis.—A careful history must be elicited in a suspected case of the pernicious form of this disease, in order to exclude symptomatic anemias. The peculiar appearance of the patient and characteristic changes in the blood, as seen microscopically, together with the history of the case are, as a rule, conclusive in making a diagnosis.

Prognosis.—The prognosis is extremely unfavorable. At times there are temporary improvements, but a fatal termination invariably occurs, either from the disease itself or from some intercurrent affection.

Treatment.—Of all medicinal agents, arsenic has proven the most beneficial in pernicious anemia, and to a certain extent has even influenced the prognosis. It is generally advised that this drug be given in tablets, or at any rate alone. Good results have been obtained from the use of the chlorid of arsenic, and Fowler's solution has also been highly recommended. Combinations of iron and arsenic have sometimes been used with good effect, but the former drug is of less use in this form of anemia than in others. Stimulation of the patient is of great importance. Equalization of the blood pressure should be attempted, either by the use of intravenous injections or massage. The condition of the stomach and intestines is of the greatest importance, and great care must be used in the administration of remedies that the digestive apparatus be not disturbed. The use of bone-marrow has been tried in this disease and has not proven of great value; however, this method of treatment is still *sub judice*.

HODGKINS' DISEASE.

Synonyms.—PSEUDO-LEUKEMIA; LYMPHATIC ANEMIA.

Definition.—A chronic form of anemia characterized by hypoplasia of the skin and lymphatic glands without any marked change in the corpuscles of the blood.

Causes.—The etiology is obscure; it is a disease of early life, and is more prevalent in males than in females. Among those diseases which

are supposed to bear a predisposing influence, syphilis, tuberculosis, malaria, and rachitis may be mentioned.

Pathologic Anatomy.—There is no pathologic lesion that distinguishes Hodgkin's disease from leukemia save the absence of leukocytic infiltration, so constantly seen in the latter disease. The lymphatic glands of all the structures of the body are affected. In some instances one solitary gland or different group of glands may show intense hypertrophy. Occasionally, secondary infection supervenes and suppuration results. The spleen, liver, and kidneys are commonly enlarged, the spleen being especially so. The bone-marrow shows degenerative changes and evidences of lymphatic tissue formations are to be seen.

The Blood.—The red blood-corpuscles may be slightly reduced in number, and at times poikilocytes are to be observed. The white corpuscles vary in number, but the deviation from normal is but slight. At times they are increased in numbers, but not to a marked extent.

Symptoms.—A slowly developing anemia is the attending phenomena marking the progress of pseudoleukemia. The patient complains of headache from the onset; vertigo and palpitation are rarely absent, and a gradual increase of weakness marks the progress of the malady. The symptom of chief importance clinically is the enlargement of the lymphatic glands and of the spleen. As before stated, any group of lymphatics may be affected, but the submaxillary and cervical glands are the most commonly involved. In many instances hypertrophy of the glands on one side of the neck, followed by the involvement of those on the other side, usually mark the beginning of an attack. Hemorrhages are common, and small patches of ecchymoses are scattered here and there over the entire surface of the body. There is usually slight fever, but it is decidedly irregular and is inclined to be paroxysmal. At times there is considerable edema beneath the eyes and about the ankles, bearing evidence of cardiac insufficiency. The bowels, as a rule, are constipated, and although the stomach is at first retentive, nausea and vomiting may later occur.

Diagnosis.—Distinction must be made between pseudoleukemia and enlarged tuberculous glands. The negative results of blood examination and a tendency of a gland to soften and break down will

point to the presence of tubercular disease. Much difficulty is often experienced in distinguishing malignant tumors (lymphosarcomata). The diagnosis can not always be made, but in many cases the recognition of the slower and more irregular growth of the tumor and the involvement of the superficial tissues will point toward malignant disease.

Prognosis.—The chances for the arrest of the disease are exceedingly meager and the outlook is most unfavorable.

Treatment.—Here, again, as in the treatment of pernicious anemia, arsenic has been found to do the most good. Hygienic treatment should never be neglected, and much benefit is often effected by the removal of the patient to new surroundings. Iron, phosphorus, cod-liver oil, and strychnin have been used with benefit in the treatment of the disease, and local applications to the affected glands may be practised and in many cases do good, temporarily at least. Surgical interference by the removal of the diseased glands, although allowable in the early stages of the disease, has thus far given negative results.

SYMPTOMATIC OR SECONDARY ANEMIAS.

Causes.—Among the many etiologic factors which produce pathologic changes secondarily in the blood, hemorrhage may be first considered. The rapidity and the intensity of the anemia following hemorrhage depends upon the length of time during which the blood is lost, as well as upon the quantity involved in the loss. Anemia develops slowly where the loss of blood is gradual, and vice versa. The chief danger is lowering the blood pressure to a point at which it is no longer possible to maintain circulation. The regeneration of the blood after hemorrhage is generally slow, but the time involved in this function varies in different individuals. ANEMIA OF INANITION produced by a deficiency or poor quality of the food-supply or to malassimilation of food is a subject of daily observation in any children's clinic, and it is in this class of cases that the most brilliant results follow scientific methods of treatment and change of environment.

THE ANEMIA OF INFECTIOUS DISEASE is peculiar from the fact that it is not until after the subsidence of the disease that the anemia becomes noticeable. The amount of anemia present will depend to a

certain extent upon the length of the attack and the character of the disease; thus, typhoid fever and pneumonia are, as a rule, followed by less anemia than malaria or tuberculosis. Under the head of ANEMIAS DUE TO DISEASES OF NUTRITION, we have rachitis as a striking example. In this disease the anemia is partly due to the accompanying gastric disorders. Anemia may also follow the use of certain inorganic poisons, notably lead, mercury, arsenic, and phosphorus. In this class the anemia is of rapid development and is severe. It is often an easy matter to trace the original source of an anemia to the invasion of parasites. Among these may be mentioned the *Tænia solium* and *Tænia saginata*. The *Bothriocephalus latus* and the *Anchylostoma duodenale* are notable for the fact that they produce an intense form of anemia. Other parasites which may produce anemia are the *Ascaris lumbricoides*, the common seatworm, and the *Filaria sanguinis hominis*. Gastro-intestinal disorders, and organic diseases generally, produce anemias moderately mild in type, while the anemia occurring during the growth of a neoplasm is frightfully severe.

Symptoms of Secondary Anemia.—The characteristic pallor of the skin and mucous membranes will give evidence of the patient's general condition. The pulse is soft, full, and rapid. Hemic murmurs are often present and may be heard in the vessels of the neck and at the base of the heart. The heart is frequently enlarged, later becoming dilated. Palpitation is constantly present, and in cases of even moderate severity. Pulsation of the cervical vessels is often heard, and edema of the feet, especially seen at the latter end of the day or at night, is a frequent phenomenon. The skin is harsh and dry, but at times perspiration has been observed. In severe cases febrile paroxysms and ecchymoses occasionally occur, and attacks of syncope give evidence of the deficiency of cerebral circulation. Very frequently the hands and feet are cold. Vertigo and ringing in the ears may be present as evidences of marked circulatory disturbances. The digestion is weak and the appetite capricious. In some cases there may occur respiratory changes, the breathing becoming hurried, and a resonant dry cough becomes a troublesome feature. Among the nervous symptoms of this condition headache, disturbed sleep, and neuralgic pain are those most commonly complained of. Emaciation is more or less marked, the patient com-

plaining of feeling depressed. There is a general lack of vitality, this finding expression in the whole appearance of the patient.

Prognosis.—The prognosis depends upon the cause. Symptomatic anemia is generally amenable to treatment, save in the cases of tuberculosis and neoplasm. Where syncope is frequent and prolonged, the outlook is not so promising.

Diagnosis.—It is, indeed, often difficult to separate symptomatic from essential anemia. A careful inquiry into the patient's general history and a thorough microscopic examination of the blood will aid us in the differentiation.

Treatment.—The original source of the anemia must be sought for and treated. In children the regulation of the diet and care of the intestinal tract often work miracles. The anemia following hemorrhage requires prompt and energetic measures. Cardiac stimulants, such as amononia, strychnin, and camphor must be used. To maintain the blood pressure where the depletion has been great, intravenous hypodermic injections (hypodermoclysis) or rectal irrigations are invaluable. For intravenous injections Osler recommends the use of the following :

Distilled water,	1000 parts
Sodium chlorid,	5 "
Sodium hydroxid,	1 part
Sodium sulphate,	25 parts.

This should be given with the patient in a horizontal position, the head being low and the limbs bandaged. Other diseases must be treated according to the various indications. For the existing anemia a soluble form of iron should be given, and arsenic may be used in combination with the above with great benefit. Above all, open air, sunlight, and a good supply of digestible food should be considered essential in any plan of treatment.

CHAPTER XIII. GENERAL DISEASES.

RHEUMATISM.

Acute rheumatism, or rheumatic fever, is an acute, non-contagious disease, depending upon some unknown infective agency, and characterized by a wide-spread inflammation of the joints, with a peculiar tendency to affect the heart. In children the serous membranes are more likely to become involved than the articulations. As seen in early life, it is usually subacute.

Causes.—The cause of rheumatism is not yet understood, but is explained by one of three theories: (1) That it depends upon a morbid entity, the result of defective assimilation, the product of which is lactic acid, or certain combinations of it; (2) the nervous theory, according to which either the nerve-centers are primarily affected by cold, and the local lesions are atrophic in character, or that this nervous disturbance brings about hurtful metabolism, so that the nitrogenous products, instead of being converted into urea, are transformed into uric acid and other poisonous products which cause the symptoms; (3) the germ theory, claiming a specific microbe as the cause of the joint inflammation, the analogy of which is well marked in the septic processes, gonorrhea, and scarlet fever.* Heredity has an important relationship to cause in two-thirds of the cases. Whatever be the poison, it has a selective tendency for fibrous and serous tissues. The immediate cause is rapid cooling of the surface, in most instances, or changes in the weather beyond our ordinary means of recognition. It is essentially a disorder of young people and relatively common in

* Various observers have recently studied the subject, notably Achalme, Riva, Triboulet and Coyon, Singer, Jaccoud, and others. Achalme's bacillus, an anaerobic, more or less motile rod, like the anthrax bacillus, is shown to produce symptoms of rheumatism.

children, although many of the cases described in infancy belong to a different affection, the arthritis of sucklings. In the young, a potent cause is predisposition or inheritance. This inheritance is frequently from a gouty parent. Children under five years are readily affected, and instances are recorded in babes of one and two years. By far the larger number of cases arise in the spring, and one attack predisposes to another.

Morbid Anatomy.—The synovial membranes of the joints and ligaments become injected, and effusion of a turbid fluid takes place into them and the surrounding tissues. Minute hemorrhages into the membranes are seen. The cartilages of the joints are roughened and swollen, but rarely suppurate. A nodular periostitis has been described. The blood shows diminution of the red blood-corpuscles and an excess of fibrin. Into both the endocardium and pericardium inflammatory lesions may arise with much plastic exudation. Fibrinous coagula are found in the heart and great vessels. Secondary inflammation, such as pericarditis and pneumonia, are often noted. Pleurisy, with or without effusion, is frequently seen.

Symptoms.—In children the joint affection is less marked than in the adult and is limited to fewer articulations, generally involving the ankles and wrists, and there is more likely to be tenderness there rather than swelling. Tender, painful, or stiff joints in children should lead to a study of the temperature and the urine. The fever does not continue long or reach very high. Delirium is uncommon. Should the fever become very great or prolonged, delirium may be present, and pericarditis should be suspected. The urine is concentrated, high colored, and scanty, the skin moist, but rarely is there such profuse sweating as in adults. The greatest danger is due to heart involvement, which is much more frequent than in older folk. Endocarditis is the most common, and arises in the majority of cases—if not in the first, then in later attacks. The symptoms of this are disturbances of breathing, a slight cough, possibly pain or discomfort in the region of the heart, and finally a murmur is heard, generally at or near the apex, occurring with the systole. An accentuated sound may follow the mitral murmur, or occasionally is heard in the aorta. Rarely there is a diastolic aortic murmur, or a diastolic or presystolic mitral murmur. The impulse is somewhat increased in force and extent, but it is very difficult to ascertain whether there be increased dulness

on percussion. The pulse is seldom regular and usually of higher tension. Congestive states of the lung are liable to arise, slight dulness is elicited, and fine râles may be heard, and along with these signs of increasing irregularities of the circulation. Ulcerative endocarditis, when it occurs, is ushered in by chills, high temperature, and profuse sweats. The danger arises here of the detachment of vegetations which, carried into the vessels of the brain or elsewhere, produce cerebral plugging, or other embolic troubles. The first sound of the heart may become merely muffled or impaired enough to cause anxiety and finally pass away. These may be due to merely hyperemic states altering the heart-sounds, subsiding with the systemic inflammation. It must ever be conscientiously borne in mind that, in spite of all recognizable adventitious heart-sounds, yet an endocarditis can be present, working serious damage, or at any moment latent states may become apparent. The temperature ranges about 101° or 101.5° .

Pericarditis is not so common in children as in adults, and is rare under seven years of age. The existence of this is more difficult of recognition than the endocardial lesions, though they may co-exist. The symptoms are those of endocarditis, with an exaggeration of the distress and dyspnea, more evidences of nervous perturbation, more fever, and more pain about the heart. It is much less easy to outline cardiac dulness in children than in adults, and very often this is of irregular shape. Auscultatory percussion, with or without the phonendoscope, makes this more exact. The form common in children is a dry pericarditis, or, at least, the effusion is not usually great. Friction sounds may be heard. Sometimes this complication precedes the arthritis, but it may occur in any stage of rheumatism, and is liable to show itself anew as different joints become affected. Pneumonia is an uncommon complication, and when present is not so much shown by cough and expectoration, as by localized dulness and sudden increase of temperature. Pleurisy is a frequent occurrence, single or double. When single, it is liable to be of the left side and thus imperil the pericardium. Chorea, which is very closely allied to rheumatism in childhood, generally shows itself, if at all, toward the end of an attack, upon the subsidence of the more acute symptoms. Chorea may begin in the height of the rheumatic process, and when it does there has probably been a beginning of cardiac involvement, and

it is most likely to arise in nervous, emotional children. Rheumatic children are frequently attacked with an acute tonsillitis, appearing much like diphtheria, or the throat inflammation of scarlatina or influenza. This pharyngitis may be the first symptom of rheumatism, or it may occur in its course, and is rarely followed by suppuration or ulceration. Fibrous nodules are sometimes described by foreign authors to be found about the joints: these are tender on pressure, about the size of a shot or a pea, recognized by touch, and occasionally insensitive. These have some relation to endocarditis, and, where frequently occurring, are said to be an index of cardiac involvement. A common sequel of rheumatism is anemia, which may be very marked and persistent. Successive rheumatic attacks induce blood dyscrasia, a lowering of all the vital forces, shown in peevishness and general discomfort. The evil effect of rheumatism on the blood resembles that of the malarial poison. Certain diseases are definitely connected with the rheumatic diathesis, as erythema of the various forms, and purpura. Muscular rheumatism is also seen in children, especially in the form of torticollis.

Diagnosis.—In the rheumatism of children, as has been pointed out, arthritis is relatively mild, the cardiac symptoms most severe: the joints may present little more than a stiffening, with tenderness upon pressure, or upon active or passive movement. In them, acid sweats and pyrexia are less prominent; the hemorrhage and vasomotor phenomena, purpura, erythema, also pleurisy are more in evidence. In children various phases of rheumatism may arise independent of one another. The diagnosis will need corroboration by estimating family tendencies, such as recurring attacks of tonsillitis or a history of rheumatic seizures. If the heart be found affected, or the characteristic nodules or erythema seen, or a history is furnished of antecedent chorea, then we may be sure of our diagnosis. The heart must be watched unceasingly, and often gives little evidence of growing damage. The symptoms of scarlatinal arthritis are so like those of rheumatism as to be indistinguishable from it unless there be some guiding symptoms.

In epidemic cerebrospinal meningitis the joints sometimes become so tender as to be mistaken for acute rheumatism. Violent headache, spasm of the neck muscles, the spots common in cerebrospinal fever, will act as sufficient differentiation. There are many conditions aris-

ing in children, accompanied by tenderness of the joints, which should be borne in mind ; among these are pyemia, scurvy, the tender joints of rickets, some conditions of syphilis, and scrofulous arthritis, and the pyemic arthritis of infants.

Course and Duration.—The complications of rheumatic fever in children influence largely its progress and curability. The duration varies from ten days to three weeks in the well-established cases and may be marked even then with fresh outbreaks of varying severity. If treatment is instituted at once, and absolute rest maintained, a much earlier recovery may be expected. If the heart becomes affected, the course of the malady is prolonged. A dangerous condition, especially to the heart, is a series of subacute attacks, following upon each other while the joints are little disturbed. Cases in very young children have been reported where recovery took place in a few days.

Prognosis.—The danger of rheumatism depends rather upon cardiac implication than upon the fever itself. When attacks are frequently repeated, this is much more likely to occur and grow worse with each outbreak. In rare instances the heart may escape after many attacks. It is extremely difficult to estimate the amount of cardiac mischief that remains after the acute symptoms have subsided. A mere roughening of the valve may disappear after a few months, but is likely to remain and give evidence by hypertrophy with dilatation. This is especially to be feared with slight recurrences of rheumatism, and above all should a sharp attack arise. Few cases of endocarditis are unaccompanied by involvement of the pericardium also. Pericarditis may occur by itself and is more hopeful. The hypertrophy or dilatation is established more readily in children than in adults, and increases at a higher rate. The appearance of fibrous nodules is a danger signal. Marked anemia following heart disturbance is a grave feature.

Treatment.—Immediately on the appearance of rheumatism the child must be put to bed and clothed in woolen or silken garments, and lie between soft, thin blankets. If the fever be high and the sweat not profuse, it is not well to keep the room very hot, but it should be dry. No movements must be allowed, and the earlier medication directed to the securing of tranquillity. If pain be not very great, this is difficult, but is most essential. The bowels must

be promptly relieved by a saline or other laxative. All dejecta must be passed into the bed-pan, which should be well warmed; the upright posture can under no circumstances be allowed until all danger is quite gone.

No definite amusement should be supplied; monotony is best, and children will more readily submit to this than adults. The tender joints require protection at all times, and among the best is simple cotton-wool kept in place by a few turns of a bandage. If these parts are very painful, wet applications may relieve them, such as solutions of bicarbonate of soda and laudanum or salicylate of methyl or witch-hazel. The fixation of the limbs by means of light splints, such as light but stiff pieces of cardboard, either straight or molded to fit, are very comforting. Cold applications will relieve pain—ice or ice-water, frequently changed. Nervous or anemic children prefer hot and dry applications. To the water thus applied, various substances may be added, such as chloroform water or mint water, or these together with a little carbolic acid and bicarbonate of soda. The blood in rheumatism has less than its normal alkalinity, or, as has been practically demonstrated, becomes actually acid. This, then, warrants the use of alkaline salts throughout the course of the disease, more or less, no matter what other medicaments are used; also, it is necessary to consider defective elimination from the blood. The remedies of most use are those which exert a preservative or antiseptic action on the tissues (Foster)—methyl salicylate, potassium iodid, iron chlorid, quinin, etc.

All medicines, moreover, should be in large dilution and the patient be encouraged to drink freely of the natural alkaline waters, such as Seltzer and Vichy. The use of internal medicines for the rheumatic fever is not very satisfactory. The compounds of salicylic acid are of value to relieve pain, but can not be shown to materially shorten the disease or prevent endocarditis. The salicylate of sodium is the best for its antirheumatic and antipyretic action, but it often disturbs the stomach. The salicylate of ammonium is useful along with the liquor ammonii acetatis. The salicylate of strontium and of cinchonidin have been lauded by some, as also the salicylate of lithium—this last more particularly for the subacute varieties. Cheadle prefers salicin alone or with sodium or potassium citrate. The salicylates should be given in full doses of from three to fifteen grains, every four

hours for three or four days, when, if they have failed to relieve, they are of little more use; if they have relieved, at the end of this time, they may be lessened one-half, for, perhaps, a week longer. Failing relief from these, we may succeed with a cautious dose or two of the coal-tar antipyretics, which are liable to depress the heart and it is well to guard them with a little strychnin, digitalis, or strophanthus. It is useful to combine the iodids of potassium or sodium with either of the foregoing group, especially after the first few days. If the fever runs high, with a failure of respiratory vigor and delirium or other cerebral symptoms, prompt and vigorous antipyresis should be employed; here the cool (80° F.) or cold (60° to 50° F.) pack is valuable, and a few well-directed doses of acetanilid or antipyrin used, carefully watched. To secure tranquillity of mind and body the bromids are useful, though depressing, especially the bromids of lithium, sodium, or strontium. Few things are better here than small doses of opium, the elixir of McMunn, or Dover's powder, or codein, especially if head involvement be suspected. Quinin or the salicylate of cinchonidin sometimes act most happily as an auxiliary measure, especially when the temperature attempts to run high, which is likely to be where there is endo- or pericarditis—five to eight grains a day to a child five years old. For the heart complications full doses of opium with or without brandy or whisky are recommended by DaCosta and Cheadle. When exudations arise, as in the pleura or pericardium, the iodids are especially valuable. For imminent heart failure, shown by a feeble first sound, small and irregular pulse, the hypodermic use of strychnin with brandy and digitalis is urged by Cheadle. It is well to avoid the use of syrups as menstrua, because of their tendency to produce acid in the stomach, and use rather a few drops of compound tincture of cardamom, which, with the alkalies, makes a sweetish mixture, with or without a little glycerin. Simple elixir or essence of pepsin also answers very nicely.

Preventive treatment is exceedingly important and has large possibilities. Children of rheumatic parents, or who have had threatenings or mild attacks, should have the utmost attention given to the hygiene of their skin, and become accustomed to regular cool or cold bathings. Nothing is more valuable than this; after the bath the skin should be thoroughly rubbed, and, if not too tender, with a fairly rough towel, or a towel dipped in brine, rough dried, and kept for the purpose. If

the skin be a leaky one, a little diluted alcohol may be applied, or spirits of camphor or aromatic vinegar. The skin must be promptly protected by clothing immediately after the bath, and at all times. After exercise or overheating, children susceptible to rheumatic attacks should be dry rubbed in a warm room, and redressed. All growing pains or joint tenderness must be watched sedulously and considered. Such children should never be too warmly clothed, except possibly as to their underwear, and should never be allowed to have their knees, shoulders, or arms left bare, or their feet carelessly wetted. Indeed, it is distinctly important for children susceptible to rheumatism to live in a dry climate, certainly in winter.

The diet is of importance and had better be nitrogenous, and not include too much of starch. Milk is the best food. General tonics are needed for the repair of the blood dyscrasia, especially iron and cod-liver oil.

Gonorrheal articular rheumatism is rare in children, but does occur, mostly confined to one or a few joints. The effusion may be large and become purulent. This must be promptly treated to save the joint and to protect from pyemic infection. The treatment is surgical—an aseptic opening of the synovial cavity, the pus removed, the cavity washed out, and the limb put on a splint. Quinin enjoys a well-earned reputation to control pain and limit extension.

MUSCULAR RHEUMATISM.

Muscular rheumatism occurs in children of from five to fifteen years of age, following exposure to wet or drafts, and especially when to these is added fatigue. It is most common in the shoulders, neck, and back, and the pain is pronounced on movement. There is little constitutional disturbance or heart involvement; it is likely to be confounded with neuralgia, and may take the form of head pain. The urine is generally highly colored and loaded with urates. The best treatment is prevention, cold baths, and care of the skin generally, along with suitable clothes. Dover's powder acts most promptly, or atropia hypodermically, followed by saline diuretics. Extreme heat, dry or wet, iodine, methyl salicylate, galvanism, also rubefacients are efficacious.

CHRONIC RHEUMATISM

Is very rare in children, but recurring short attacks of a rheumatic nature, with stiffness and pain, are met with. This requires persistent hygienic measures, along with massage, the application or rubbing in of ointments, as ten grains of iodin, twenty of extract of belladonna to the ounce of lanolin. Cod-liver oil is almost a specific.

RACHITIS.

Rachitis, or rickets, is a disorder of nutrition primarily, but so numerous and characteristic are the attending disturbances of the nervous system that it may be regarded as secondarily a neurosis. Rachitis is a complex constitutional disorder of childhood, characterized chiefly by evidences of defective nutrition affecting all the structures, but more conspicuously the bones, exhibited in a lack of tone in the ligaments, causing bow-legs, knock-knees, flat-foot, and weakness of the muscles.

Along with these phenomena are frequently seen profound nervous symptoms, craniotabes, with its resulting hyperemia, and other cerebral disorders, insomnia due to this, night-terrors, irritability of temper, at times rising into maniacal attacks; laryngismus stridulus, convulsions, hydrocephalus, tetany with Trousseau's symptom, spasmus nutans (nodding or rotary spasm), nystagmus, and hyperidrosis. These states all may be entirely recovered from, and usually with no resultant cerebral damage.

Digestion is also seriously deteriorated; there is a marked tendency to intestinal and other catarrhs, anemias, and vitiation of the blood.

Rachitis is a far more common condition than statistics would lead us to believe. It often disappears spontaneously under favorable circumstances or changed conditions from those which produced it. It is at the foundation of much of the impaired resistance in infancy and early childhood. When the active process ceases and only the deformities remain, the individuals are oftentimes most vigorous, both physically and intellectually.

Causes.—Rachitis is found the world over, chiefly in cities or in crowded, underfed communities, lacking light and air, and is rare in country-places or where the food-supply and hygienic conditions are

favorable. It is more common in Europe than in America, and our supply of cases of the disease is derived mainly from thence. Observers in the large clinics of Europe admit its appearance in over thirty per cent. of children applying for advice. In this country it is not quite so common or severe, even in our largest cities, and is comparatively rare out of crowded centers unless brought from thence. With us in America it is seen either in the children of emigrants or in the negro and mixed races, especially in babies who have been hand-fed or who early get coarse or unsuitable food, especially when this is deficient in fat. It appears now and again in the families of the well-to-do, even among the very rich, especially where nervous mothers coddle their children overmuch or practice erroneous methods of feeding and nursery hygiene. Rickets is rarely congenital. The disease usually develops between the first and second years.

Predisposition has much to do with the production of rickets. The offspring of parents in feeble health, of poor digestion and assimilation, senility of the father, and a mother from any cause exhausted, as by discharges of pus or blood, etc., either or both parents overworked or underfed, is apt to be rachitic. Rachitis is not hereditary.

Parental syphilis, alcoholism, and tuberculosis frequently induce rachitis. Infants who begin life with an unfavorable inheritance, and who are confined in dark, filthy, overcrowded houses, especially in damp cellars, are very prone to develop the disease; even those who begin with good constitutions may thus become rachitic. The most powerful factor is food deficient in certain essential qualities, as fat and albuminoids. Babes who depend upon breast-milk from poorly nourished mothers, or upon the parental supply for too long a time, are liable to the disease; even where the supply of food is good and yet the digestion is too weak to cope with it, infants may thus be affected. Rickets is a frequent sequel of exhausting infantile disorders, especially in one predisposed.

General Symptoms of Rachitis.—The first symptoms of rickets in a child are fretfulness, disturbed, intermittent sleep, and slight fever at night. The little patient becomes mildly cross, repelling advances, its pillow becomes wet with sweat during sleep, beads of perspiration appearing first on the forehead and face. It seems to suffer from a sensation of heat or oppression, and kicks and throws off the bed-clothes, inducing a peril from chilling of the surface thus exposed.

There is always marked pallor, and often a diffuse soreness and tenderness of the body. The digestion is markedly disturbed by flatulence, fetid stools, and diarrhea, with evidences of intestinal catarrh. The liver and spleen are often enlarged, and dentition is delayed. The veins about the head are seen to be large and full. On being touched, the child shrinks away or cries; the flesh is sore, but this is probably due to a morbid state of the periosteum, though not entirely, because the abdomen is also tender. The child is only comfortable when lying quietly or held carefully in the arms. In some there is a slight temperature rise in the latter part of the day, and a moderate quickening of the pulse. After a time changes in the skeleton occur, first to be felt and later to be seen. Craniotabes, or thinning of the cranium in spots, is a very characteristic deformity, occurring during the first year, usually before the tenth month. This is a source of considerable peril, because of leaving considerable areas of the brain undefended by proper mechanical protection. The condition is ascribed often to a double infection of syphilis and rickets acting together. Such a child is more than ordinarily fretful, especially when lying down, because in this position pressure is exerted almost directly on exposed areas of the brain. Cerebral circulation is thus disturbed, hence sleep is unquiet, the child awakens readily, and needs to have its position altered. This possibility of varying pressure may produce considerable disturbance of the vasomotor and cardiac centers in the medulla. Many slight changes are thus produced in the brain, oftentimes but temporary, exaggerating the well-known susceptibility of rachitic infants to neuroses. Laryngismus stridulus, or glottic spasm, while not common, is a characteristic phenomenon, occurring suddenly with an arrest of respiration, seemingly a palsy of the respiratory center; the face becomes deadly pale, a moderate rigidity of the limbs sets in, with carpopedal spasms. After a few seconds a long, deep, effortful inspiration is made, and this, passing through the narrowed chink of the glottis, causes a whistling sound or cock crow, and the attack ends with a waking-up of the patient in a dazed and surprised condition. Rachitic infants are especially liable to convulsions, also to tetany. These unfortunate children are peculiarly defective in their power of resistance. The altered shape of the chest walls, which is often a lateral depression of the ribs, and thrusting out of the sternum anteriorly, produces changes in the shape of the organs within. The heart is not seriously affected,

but the completeness of its movements is interfered with. The lungs, moreover, can not expand properly, from which may come a host of symptoms due to impaired circulatory and respiratory completeness, of little importance in moderate health, but acting as a source of great danger in disease. A partial collapse of certain lobules of the lung is likely to occur on slight congestion, especially along their thin edges. The lateral and posterior parts suffer from pressure, and the anterior borders may become emphysematous. If in such an one bronchitis or bronchopneumonia occurs, the elimination of mucopus is difficult and cyanosis of a serious sort readily arises. A peculiar form of "pressure palsy" is sometimes seen in rachitic children, owing to inflammatory change in the vertebræ compressing the cord, and from this they almost always recover.*

An acute form of rachitis is recognized by a more marked febrile movement and tenderness than occurs in the usual slow variety and in which the joint swellings appear more quickly.

The change in the bones of the head leaves the fontanel open long after it should have closed (at about eighteen months), and at a year and a half to two years it may be one to two inches wide. The head is usually larger than that of a normal child, and by contrast to the shrunken body seems much larger.

Deformities.—A child distinctly rachitic is a conspicuous and familiar object in all clinics, and in the practice of all except physicians in very fortunate rural localities. Those in whom the disorder is less graphically marked can yet be readily recognized by a well-defined train of phenomena.

The general appearance of a rachitic child is that of one badly modeled by a novice. Pallor is a constant feature; the blood is low in hemoglobin, below fifty per cent. or less, sometimes there is a leukocytosis, but the red cells are little, if at all, affected. Most rachitic babes are and doughy, lacking in tone, with little resistance in any of the fat tissues. As they grow older the lymph-nodes become enlarged and the tonsils hypertrophy, as do also the adenoid tissues about the vault of the pharynx.

The mucous membranes are easily disturbed, both in the respiratory

* One of us reported three instances of rachitic pseudopalsy occurring in a family where twenty cases in all had been noted.—"*Annals of Gen. and Ped.*," Dec 1891.

organs and in the intestines and bowels. Digestion is poor, diarrhea easily induced and difficult to check. Fortunately, the appetite is usually good, especially for fats and flesh meats, so much needed, and these articles are readily assimilated.

Catarrhal attacks are liable to run a protracted course and extend broadly. The nervous disturbances have been alluded to and are dependent upon defective nutrition of the centers which in children are in an undifferentiated state, and interference in their proper growth is quickly followed by profound perturbation of function.

Dentition is apt to be very late, and the slight congestive stages of tooth growth and eruption are enough, in a rachitic child, to act as exciting causes to the very unstable condition of its nervous forces; hence these children suffer extremely from what is usually a normal process.

The order of teething is not changed materially, though it may be very irregular, nor are the teeth themselves defective; this last in sharp contrast to syphilis, which is said by some to be so closely connected with rachitis.

The more graphic phenomena of rachitic children are the deformities essentially symmetric, and first seen in the enlargement of the bony junctures, especially the ribs and the costal cartilages, forming the much-quoted "rosary," and present in nearly all cases a valuable diagnostic sign.

The head appears to be too large and is out of proportion to the body, though not, as a rule, of much greater circumference than a normal head. It is usually square, because of the prominence of the parietal bones, and flattened at the vertex and occiput. Sometimes this is accompanied by a sulcus, or furrow, in the mid-line anteroposteriorly, and laterally along the coronal suture. The sutures remain open much longer than in healthy heads. The fontanel is open as late as the end of the third year in some instances.

The chest is frequently deformed by the bending in of the ribs at the costocartilaginous junctures and lateral depressions over the lower third of the thorax and eversion of the lower borders of the ribs. The ensiform cartilage is sometimes markedly depressed, leaving a circular concavity. The cause for this is largely atmospheric pressure from without not being counterbalanced by internal resistance upon the malleable ribs.

The spine is not generally deformed, but kyphosis or posterior protrusion is the most common; occasionally there is rotation. The pelvis rarely escapes some distortion, generally a diminution of the anteroposterior diameters. The limbs undergo conspicuous changes in shape from the malleable state of the bones, and slight muscular strains increase these as activity progresses.

Enlargement of the epiphyses is the characteristic feature, commonest at the wrist, sometimes at the elbow. The long bones suffer deformity, particularly of the legs, from the pressure on them while attempts are made at standing. This induces bow-legs and knock-knees, rarely a curve in the femur. While sitting, however, a more marked double curve is given to the lower limbs from the cross-legged attitude long continued. In the early stages of deformity, while the bones are so soft they can be bent by hand, braces are of most value. These must reach above the knee and should be provided with rods placed opposite the points of greatest convexity, and exert continuous pressure. Success varies with the individual case. If the bones can not be remodeled thus, osteotomy is demanded, and the orthopedic surgeon should be consulted early in the case, not only to operate or brace, but to critically watch progress.

After the third or fourth year braces usually do little good without some form of cutting operation on the bone itself. Many children are too poor to pay for braces, which, to be efficient, must be well made and kept in perfect repair, and plaster-of-Paris bandages may then be used with advantage. The different bones of the same individual vary in density; the leg of one side and the thigh of the other may be soft, while the corresponding bones on the other side may be hard; but this, of course, is not the rule.

For a description of the braces most commonly used the reader is referred to the works on orthopedic surgery, as well as for the details as to the operation of osteotomy. This latter consists in cutting through the femur and straightening the thigh for knock-knees, or through the tibia and fibula for bow-legs. It may be necessary to operate upon both the femur and tibia and fibula at the same time before the leg is straightened. The bone may be simply cut through and the leg straightened, or, if the deformity be very great, a wedge-shaped piece may be cut out of the convexity of the bone to insure a good result.

The limb should then be enveloped in cotton, or a plaster-of-Paris bandage applied to keep the limb straight.

In young children, especially, it is sometimes well to suspend the limbs from a frame at right angles to the axis of the body; this insures extension and at the same time keeps the bandage free from being soiled with the urine and feces. The limb should be kept longer in plaster than for the healing of an ordinary fracture, as the repair of bone is somewhat delayed owing to the rachitic condition.

Pathology.—While true that the most marked changes are observed in the ends of the long bones and ribs, the morbid anatomy is that of a constitutional disease, a blood dyscrasia, affecting the nutrition of nearly all tissues of the body, and thereby producing disease in the osseous system, which is closely allied to inflammation. The primary lesion is hyperemia of the periosteum, the marrow, the cartilage, and of the bone itself. The disturbance of the normal growing bone causes changes in the bone already formed. The cartilage cells of the epiphyses consequently undergo increased proliferation from four to eight times more than they do in a normal growing bone. The matrix is softer; as a result, the bone which is formed from this abnormal cartilage lacks firmness and rigidity. The increased proliferation of cells makes the epiphyses larger, swollen in appearance, irregular in outline, and very much softer in consistence. The high vascularity favors the process of absorption in the bones already formed, so that the relation between removal and deposition of lime salts is disturbed, absorptions having taken place more rapidly. It has been experimentally proved that hyperemia of bone causes defective deposition of lime salts. In the parieto-occipital region and in some other cranial areas ossification is retarded, so that the bone readily yields to pressure by the finger (craniotabes). The fontanels are not promptly closed by reason of delayed ossification. The frontal and parietal protuberances are very much enlarged, due to exaggerated proliferation of the periosteum, so that the head acquires a broad forehead, with characteristic frontal eminence, a condition mistaken for hydrocephalus. When ossification begins to take place the bones become large, heavy, and irregular in outline. These changes correspond to the graphic clinical manifestations—bow-legs, knock-knees, pigeon-breast, spinal curvature, and square cranium. The wrists, ankles, knees and ribs at points at the junction of the bone and

cartilages become enlarged ; on the ribs they occur in a series simulating beads, and is called the "rachitic rosary." The prominent visceral change is the enlargement of the spleen and liver.

Prognosis.—The disease is not fatal of itself, but death often readily results in the enfeebled organism from some intercurrent malady. Under proper treatment recovery takes place with some resulting deformity.

Treatment.—As has been said, we may assume that nearly one-third of all the children of our city population and perhaps a fourth of others either exhibit the evidence of rickets or may readily acquire the disorder. Therefore, a thorough consideration of detailed treatment can not be out of place. We will review here an outline of such systematized measures as are suitable, and in the chapter on General Considerations on Physical Development the matter will be treated more fully. The first consideration is prevention ; here it is necessary to face the question of accepting or rejecting degenerate immigrants—a matter which is probably about to play a very important part in politics.

The next step is to give our attention to pregnant women who are of these devitalized classes and races. If this can be done, much may be accomplished. Bathing, good air, sunlight, and abundant, well-cooked food will accomplish much. A short residence in the country would do more. The relief of the coming mother from exhausting labor and overwrought emotion is also of great value. The result of such care may be a pretty fair homunculus, and upon such a little one continued liberalizing influences will work to great advantage, and a few generations of such measures regenerate a moderately good population. The rachitic baby should be kept in a room which faces the south, whence come the best breezes in summer and sunlight at all times. It should be kept at a temperature in the neighborhood of 70° F., with the windows much open, or on sheltered housetops or piazzas, wearing extra clothing the while. Underwear should be of wool, thin in summer and thicker in winter ; bathing should be daily, as much for tonic action as for cleanliness. If the extremities become chilly after this, or at any time, it is easy and valuable to apply external heat. The breast milk of the mother is always the best, and during lactation she should take tonics and extra food rich in fats and albuminoids. The mothers of the poorer classes fill themselves up on bread and tea

while nursing a baby ; they had better live on milk and meat. It is important that mothers of babies showing rickets should sacrifice something to the needs of lactation. Good breast milk when insufficient is of little use if supplemented by coarse, ill-cooked "table food." Poor breast milk is better than none, because it can be made better unless the mother be distinctly infected, as by tuberculosis. The natural supply can be supplemented by suitable food better than to depend upon hand-feeding alone. For rachitic babies this extra diet is nearly always necessary, and certainly after eight or ten months, and this should be carefully guarded cow's milk modified by water, milk, sugar, and cream, an alkali, and possibly some "casein breaker." This should alternate with strong animal broths and but little or no starch food. Starch feeding produces rickets in those predisposed. Weaning should not be allowed in the hot months, certainly not in our large cities. In the preparation of milk, the first requisite is proper preparation as soon as it leaves the cow, and this is receiving most gratifying attention at the hands of dairymen increasingly from year to year.

If the milk be sound and kept so, it need not be subjected to heat to fit it for use. As ordinarily supplied it will require pasteurization or sterilization. Simple boiling over a water-bath does fairly well, especially for older children. Prepeptonization is of great use, particularly for one or two meals in a day, and along with supplemental diet.

Properly prepared cereal solutions, as of barley or oatmeal water, are not only cheap and convenient diluents, but of real value to separate particles of casein and prevent lumpy curds in the stomach, but they are in themselves nutritious. They are far better when diastase has been added. The amounts and intervals of feeding are of as much importance as quality. Breast-fed infants of vigorous stock may survive some insufficiency, but the feeble, rachitic infant should receive over- rather than under-feeding. The value of over or forced feeding in children has not been studied enough except where the food was of bad quality.

It often happens that a very young child, especially a rachitic one, will greedily devour and thrive notably on a liberal diet of beef and mutton.

Constitutional treatment must be instituted in the first half year or

year to be efficient. Little can be expected after the second year, for by that time we have chiefly the effects of the disease, not the disease itself, to deal with.

For the deformed chest, hence cramped lungs, regulated gymnastics are indicated. Rarefied air deserves more extended trials. For kyphosis, extension and postural treatment is indorsed, along with prolonged rest in bed.

Medicinal Treatment.—Rachitic children are particularly liable to gastric and intestinal disturbances and weaknesses; their stomachs are usually hyperacid and need alkalies; for the relief of this in the infant, pancreatic extract with soda is of use; in older children, well-diluted muriatic acid and pepsin is better; also there should be supplied other secretions of the intestines which assist assimilation. Peptenzyme, or similar preparations purporting to contain the active ferment from most of the intestinal glands, has a useful function. It may be well to mention here the malt preparations as being useful if there be no diarrhea, and to be added to starch food or given alone. The great remedy for rickets is cod-liver oil, because of its fat, and not less because of its bile salts, and of less than half its value if these biliary principles are destroyed or injured in the preparation. To cod-liver oil may be added with advantage raw eggs, glycerin, or syrup, and spirits or some heavy-bodied wine or cordial. If we could be sure of getting a cod-liver oil made from fresh livers of fresh cod-fish, and prepared by cold expression, we would have the best thing obtainable. Some years ago this was forthcoming at the hands of an old sea captain, named Stone, of Swampscott, Mass. A favorite preparation of the authors is: Place in an eight-ounce bottle one raw fresh egg, glycerin, $\frac{1}{2}$ of an ounce; maraschino (or curacao, or sherry wine, or port wine), $\frac{1}{2}$ of an ounce, cod-liver oil, six ounces; shake thoroughly, and keep on ice in the dark, and give a dessertspoonful before two principal meals. One drug which enjoys a large reputation in overcoming with great promptitude and thoroughness the defects of bone growth in rickets is phosphorus. This should be given in small dose, $\frac{1}{200}$ to $\frac{1}{100}$ of a gr. after meals. Iron, manganese, and arsenic are of value for the anemia. To relieve sweating, atropin, picrotoxin, and the cardiac tonics are useful, as well as aromatic sulphuric acid.

SCORBUTUS (INFANTILE SCURVY).

Infantile scurvy (scorbutus) is a disease characterized by the symptoms of malnutrition, attended with general debility, anemia, petechiæ and ecchymoses in various parts of the body (principally upon the lower extremities and mucous membranes of the mouth), general muscular weakness, amounting to immobility in the lower extremities (going on to pseudoparalysis), attended with swelling about the joints and tenderness along the lines of the long bones, rarely terminating fatally when placed under proper treatment, and etiologically holding an important relation to the deprivation of fresh foods.

Causes.—Infantile scorbutus usually develops insidiously; a predisposition to rickets, scrofula, and the existence of hereditary syphilis must, of necessity, increase the tendency to the production of the disease. That in the various proprietary infant foods and sterilized milk we lack in many cases a certain something which is needed for a proper nutrition of the tissues, there can be no doubt. Faulty assimilation may in some instances be sufficient to lay the foundation for an attack. It would appear that the source of the evil is to be found in an impaired power of assimilation from the beginning. No known micro-organism has been discovered to produce the disease.

Pathology.—Though we have been enabled to perform but few autopsies, the lesions found are of sufficient importance to deserve attention. The blood, microscopically, presents the appearance observed in anemia, varying in degree with the severity of the attack. The red blood-corpuscles have varied in the observations we have made from 2,200,000 to 3,800,000 per c.mm. hemoglobin, from eighty per cent. to fifty per cent. The red blood-corpuscles frequently presented the regular appearance known as poikilocytosis, with no other notable change. In one case slight pigmentation was observed.

Macroscopically, hemorrhages, petechial and ecchymotic, into the soft parts are frequently observed in the muscles, kidneys, spleen, gastro-intestinal tract, and osseous system (principally subperiosteal). Ophthalmoscopic examination has shown hemorrhages into the retina which have disappeared under treatment. With the exception of the subperiosteal hemorrhages, the skin and the mucous membranes, principally of the mouth, are most frequently affected. Extensive ulceration of the gums with exuberant granulation, overlapping the teeth

and obscuring them entirely from view, is not an uncommon condition in the advanced stage of the disease.*

In cases terminating fatally, hemorrhages, both microscopic and macroscopic, have been observed in all the organs and tissues of the body, the condition becomes an actual blood dyscrasia.

Symptoms.—The symptoms of infantile scorbutus are both constitutional and local. The attack may be precipitated by a number of acute symptoms, gastro-intestinal in character, with fever, and the constitutional disturbance associated therewith. The temperature ranges from 100° to 102° F.; a fever of 105° and above is rare. More often the disease develops insidiously. The child becomes peevish and fretful, the appetite capricious, though usually poor, temperature but slightly above normal, frequently holding within the normal range. The child lies upon its back with limbs extended or slightly flexed. The anemia, which at first was slight, becomes more marked, and with it excessive irritability. Pressure along the tibia and femur and about the knee and ankle-joints is attended with considerable pain; the child cries out, but makes but feeble effort to be released. If the disease is far advanced, the position becomes characteristic, the pain becomes acute—now, the slightest movement causes the little patient to cry out as if in great suffering. The excessive tenderness about the extremities has frequently occasioned the affection to be mistaken for one of acute rheumatism. If the skin is carefully examined, not infrequently distinct petechiæ with ecchymoses may be observed upon the legs and thighs. Oftener the mucous membranes, especially the gums, show evidences of the disease; there may be but slight swelling. This is frequently the case before the eruption of the first teeth; afterward the gums become swollen and red, suffused with blood. The spongy areas show a tendency to bleed upon pressure. This condition may grow worse, going on to ulceration, and presenting in places patches of localized gangrene, the overlapping of the gums completely obscuring the teeth from view. In a case which came under our observation this year which had been treated locally with a solution of nitrate of silver there was presented all the appearance of linear ulcers along both the upper and lower gums,

* See "Boston Medical and Surgical Journal," October 29, 1896, article on "Infantile Scorbutus," by Joseph Leidy, M. D.

with exuberant granulations, from which there was constant oozing of blood. The enlargement about the joints deserves special note. The swelling is along the shaft of the long bones, about the line of separation between the diaphyses and epiphyses, and outside of the joint proper. The parts are sensitive to pressure, and become extremely painful as the disease advances. There is no rise in the local temperature of the part. The indisposition of the patient to move the limbs is due, primarily, to the pain which is produced upon motion, and in advanced stages of the disease to muscular weakness. This symptom has frequently been mistaken for paralysis. The electric reactions of the muscles are, however, normal; the knee-jerk is usually lessened or lost. This condition of pseudoparalysis is rarely present in the arms.

THE HEART AND CIRCULATORY APPARATUS present no symptoms of importance except partaking of the constitutional symptoms associated with the febrile movement. In a number of instances hemic murmurs have been noted where the anemia has been marked. The presence of moist râles in the lungs, posteriorly, is not unusual. Hemoptysis is rare, but when present may be considered a grave symptom.

KIDNEYS.—Albuminuria is not infrequent. The presence of hyaline and blood casts is not rare, according to various authorities. In nine cases observed during the past year, however, in but one were blood and hyaline tube-casts noted. The symptoms of infantile scorbutus vary in degree from attacks of slight severity to the more advanced and aggravated forms. We have observed that the hemorrhagic condition of the gums is no guide to the state of the lesions in other parts of the body. For instance, in a case which presented but slight swelling of the gums there was persistent hematuria and numerous spots upon the skin. On the other hand, in a case in which the gums were extensively involved the swelling about the joints was slight, with no marked symptoms referable to the lower extremities. In another, where the patient was brought to us as a supposed case of rheumatism, the weakness in the lower extremities was marked, the skin showing a marked petechial eruption over the anterior portion of both legs, with no involvement of the gums; and in still another, the hemorrhagic state was general; on the gums, about the pillars of the fauces, with the presence of blood in the urine and stools, and no involvement of the skin. In a case supposed to be one of infantile

palsy, there was simply weakness in the lower extremities, extremely sensitive to pressure over the shafts of the tibia and femur, with slight sponginess of the gums, marked diarrhea, and profound anemia.

Diagnosis.—From the insidious nature of infantile scorbutus, the history of the case, and the character of the symptoms, there can be no difficulty in reaching a correct diagnosis. General debility, anemia, sponginess and bloody extravasation of the gums, petechiæ and ecchymoses upon the skin, especially upon the lower extremities, enlargement and tenderness about the joints and along the shafts of the long bones, and an apparent loss of power, muscular rather than nervous in origin, in infants fed upon one of the proprietary foods or sterilized milk, present a picture characteristic of scurvy; finally, the therapeutic test referred to under treatment.

Until within recent years infantile scorbutus was considered a rare affection, doubtless due to the old classification which included the disease under the head of rickets, purpura in its various forms, and hereditary syphilis.

Differential Diagnosis.—Infantile scorbutus is most frequently confounded in the early stages with acute rheumatism. The records of cases show this to be a most common source of error. The absence of marked febrile disturbance and the location of the swelling about the joints, the condition being devoid of local febrile disturbance, aid us in distinguishing the true nature of the attack. In rheumatism, the swelling is confined to the synovial sac; in scurvy, it is above and outside of the joint proper; from rickets, the history of the attack and absence of the evidences of rickets, the rapid subsidence of the symptoms under treatment, all go to exclude the diagnosis of an affection the symptoms of which are usually of prenatal origin. In those cases where scurvy occurs in children previously the subject of rickets, the diagnosis might appear difficult; but even here the rapid disappearance of the acute symptoms under treatment would aid us in eliminating a distinctly constitutional disease. This constitutes the so-called *therapeutic test*.

Prognosis.—Except in the advanced stage of the disease, associated with marked constitutional disturbance, the prognosis is good. Fortunately, it is a disease which rapidly responds to treatment. In those cases seen late, and which have been neglected, the vitality being low, the hopes for recovery are not encouraging, though even

here it is astonishing what can be done by a properly arranged regimen.

Duration.—The duration of the disease is variable. In cases early placed under treatment, improvement may be swift, the acute symptoms rapidly subsiding. Instances where the disease extends over a longer period—from six months to a year—are not rare; the danger of laying the foundation for organic disease must not be lost sight of. Relapses are not uncommon.

Treatment.—The etiology of this affection is a sufficient guide to the treatment. First, *change of food to a diet rich in fresh foods is all essential*, and is a *sine qua non* of a character suitable to the age of the child. Orange juice, beef juice, with the use of pasteurized (or what has been termed humanized) milk for infants, have proved ample in our hands. Medicinally, the use of minute doses of citrate of iron and, later, arsenic, in the form of Fowler's solution, become useful adjuncts. Hot and cold douches to the extremities, in conjunction with rapid friction, prove highly beneficial during convalescence, when the progress is slow.

In those cases which show evidences of gastro-intestinal irritation the use of Fairchild's Peptogenic Milk Powder has given most satisfactory results in our hands. The success which follows upon the above course of treatment has occasioned the term "therapeutic test" being applied to it. We can not too strongly urge the course of a *mixed* diet, rich in fresh food, nor can we too strongly condemn the use of sterilized milk as a routine diet for infants. In the pasteurization of milk we obtain the same results without the destruction of those elements essential to a proper nutrition of the animal tissues.

SIMPLE ATROPHY.

Synonyms.—INFANTILE ATROPHY; MARASMUS.

Although the group of symptoms which form the condition known as marasmus is common enough in all forms of gastro-intestinal diseases in children, and especially so in the chronic variety, yet there is a condition, as has been described by Starr, Rotch, and others, in which, without any particular part of the digestive apparatus, or, indeed, any organ in the child's body being at fault, the child undergoes a progressive decline, this condition being accompanied by char-

acteristic symptoms of very obscure pathology. In other words, the infant (for it is generally during the first year of life that the condition occurs) slowly starves. It may get food enough; the food may be rich enough to support the lives of other children; nevertheless, for some reason it is not adapted to the digestion of that particular infant. In another class of cases, the food given is deficient in nutritive properties, or, being nutritious enough in a general sense, the food is not suitable for a child of the age of the patient. The infant, then, is very much in the position of a carnivorous animal fed on granivorous food, or vice versa.



FIG. 22.—ACUTE ATROPHY (ACUTE MARASMUS).

From patient in the Department of Obstetrics and Diseases of Infancy, Polyclinic Hospital, Philadelphia.

Causes.—These may be divided into three classes: (1) Causes due to a condition of general feebleness in the child itself; (2) causes due to defective constitution of the mother's milk; (3) defective methods of artificial feeding.

The first group of causes may be found in a certain number of infants, not a large number, whose digestive organs through feebleness of constitution are incapable of assimilating any food, the mother's milk included. Many of these infants are the offspring of families tainted by specific, tubercular, or scrofulous diseases, or are descendants of those parents who, for several generations, have undergone the

various depressing influences, nervous and otherwise, which are caused by poverty, overwork, dissipation, bad food, and unhealthy surroundings; feeble children, in whom all the bodily functions are depressed. In the second class of cases the mother's milk is at fault. Here, also, family history and the conditions mentioned as causes in the first class play an important part, but in this second class the nutritious principles of the mother's milk are much below the normal. The nursing mother should have suitable food in sufficient quantities, and of such kind as to make good milk. In the poor, the abuse of tea, which is generally of bad quality, and is often taken in large amounts, is not an uncommon source of an inferior quality of milk. In some cases the mother's milk contains too high a percentage of fat, or even of proteids, for the digestion of her child, or, where these two elements are normal in amount, the child may be too feeble to digest its mother's milk. In some cases, the too frequent feeding of a poorly developed infant, or allowing it to nurse too large quantities of milk, may finally induce a chronic condition of malnutrition. By far the most common cause is bad artificial feeding. This subject has been dealt with at length in the chapters on infant feeding, but we must say here that of all the cases of atrophy which yearly come under our notice, probably three-fourths are bottle-fed, the largest number being fed on condensed milk, starchy or farinaceous foods, or unmodified cow's milk. We are sorry to say that in many cases physicians attending such cases are at fault, as they pay too much attention in their treatment of these infants to the administration of drugs, and attend far too little to the study of the patient's digestion, and the adaptation of the proper modifications of milk (the infant's natural food) to its digestive apparatus. Food given in excessive quantities and at irregular intervals may, by its remaining undigested and undergoing subsequent fermentation, produce chronic indigestion, followed later by marasmus. The use of improper methods of feeding, dirty nursing-bottles, in fact, a general lack of cleanliness and filthy surroundings, all act as causes.

Pathology.—The pathologic changes found in acute atrophy vary considerably, and in many cases seem to bear no relation to the disease. In the majority of cases the postmortem appearances of the various organs of the body are simply those found in any case of slow starvation. There is practically no fat in any of the parts of the

body where it is usually deposited, but in many cases of advanced type fatty degeneration of various organs, particularly the muscular tissues, has taken place. All the muscles are in a state of atrophy, and this applies not only to such muscles as are found in the extremities, but the heart and muscular coats of the intestines may also share in this change. Quite frequently there is engorgement of the lymphatics here and there throughout the body, but these changes occur in no regular order and seem to bear no relation to the disease.

Symptoms.—The earliest symptoms of the disease are, usually, progressive loss of weight and constant desire for food. The child seems to be continually hungry; it will eagerly grasp the nipple and suck ravenously. Almost from the very beginning the infant is irritable, continually crying, and seems never satisfied. The form soon loses its plumpness, the ribs begin to show, and the various joints are plainly marked. The wasting is most distinct in the limbs and face, the latter assuming an expression which is eminently characteristic of the disease. The eyes become sunken, and the forehead by contrast appears prominent. There is great wasting in the lower part of the face, so that it assumes a triangular shape; the ears are prominent, the cheeks sunken, and deep furrows appear around the mouth; the whole face assumes an aged type; the abdomen is distended, although generally to not a marked extent. There is great emaciation of the upper and lower extremities, and this is especially conspicuous in the thighs. The muscles appear to be small and atrophic, and are covered by no fat. The skin hangs in folds, is generally dry and scurfy, and may at times be covered by various forms of eruption. The temperature is usually normal, indeed may be below the normal point, but, on the other hand, it is not uncommon for these infants to have a slight rise of temperature at night. The appetite is generally ravenous, but each nursing is accompanied by severe vomiting, the vomited matter being mostly composed of sour curds. The tongue is coated, and usually presents the appearances most generally seen in chronic gastro-intestinal disease. The digestion is poor and the powers of assimilation in many cases seem to be almost *nil*. The bowels are generally irregular; either diarrhea or constipation may accompany the disease. The movements are greenish or greenish-yellow in color, and are very frequently accompanied by the discharge of large quantities of stringy mucus. Colic is nearly always

present and is generally worse at night. The nervous symptoms are sometimes very severe. In the earlier stages, restlessness, particularly at night, general irritability, and night-terrors are present, and in severe cases convulsions are not at all uncommon. Starr relates that he has seen cases in which there was retraction of the head and a characteristic decubitus simulating quite closely tubercular meningitis. The resemblance was increased by general hyperesthesia and the presence of the *tache cérébrale*. Physical signs referable to the heart and lungs are generally negative, although it is not an uncommon thing to find a considerable amount of bronchial irritation appearing during the teething period. The urine is usually of a darkish yellow color, and ranges from 1.010 to 1.013 in specific gravity. According to Starr it is frequently cloudy or milky, becoming clear as recovery progresses. The sediment deposited on microscopic examination will be found to contain amorphous and crystallized urates, cylinders, mucus, and various fatty elements. Albumin and sugar may be present.

Diagnosis.—The disease with which simple atrophy is most apt to be confounded is general tuberculosis; indeed, the symptoms of the two diseases are so much alike that it may almost be impossible to differentiate between them. In tuberculosis, however, the elevation of temperature is greater and more regular, with morning remission and evening rise. There is also cough, bronchial râles throughout the chest, and occasionally slight edema of the legs. Tubercular meningitis may be differentiated by the fact that in this disease we have a full pulsating fontanel, whereas in acute atrophy the fontanel is always depressed. In tubercular meningitis the abdomen is generally scaphoid, and there is also present in almost all cases the hydrencephalic cry. Syphilis may be distinguished by its characteristic eruptions, the presence of mucous patches, and by the specific coryza usually seen soon after birth. Enlargement of the spleen and liver and the characteristic enlargement of the knee-joints, any or all of which are seen in syphilitic subjects, will also aid in diagnosis.

Prognosis.—Although the outlook for the recovery of children affected by simple atrophy is not always the best, yet at the same time with improved methods of feeding, particularly by the accurate methods used in large milk laboratories,—such as the Walker-Gordon method,—a very large number of these cases ought to recover. Home modifica-

tion of milk, if accurately carried out, will be found of very great benefit.

Treatment.—The success of the treatment of simple atrophy depends far more upon the diet of the infant than upon the administration of drugs. In infants whose digestive apparatus is too weak to assimilate the mother's milk, a diet of artificially modified cow's milk should be experimented with until a formula can be made up which the patient can take and assimilate. In this matter our experience has, upon the whole, coincided with that of Professor Rotch, of Boston, namely, that the most successful milk modification for this class of children is one with a low percentage of fat, a moderate percentage of proteids, and a high percentage of sugar; on the other hand, we have had a number of patients who only began to thrive when the percentage of fat was increased considerably. The following formula has proved very useful, and was in two or three cases retained where other milk combinations were quickly vomited:

Fat,	from 1 to 1.50 per cent.
Sugar,	from 6 to 7.0 per cent.
Proteids,	about 1 per cent.

In a case of extreme atrophy coming to the out-patient dispensary service of the Polyclinic Hospital, the following formula was first tried:

Fat,	1 per cent.
Sugar,	6 per cent.
Proteids,	1 per cent.

It will be seen in this case that both the fat and sugar were rather low; the patient, however, continued vomiting large masses of curd, and the following prescription was given:

Fat,	3.0 per cent.
Sugar,	6.0 per cent.
Proteids,	0.4 per cent.

In a short time the colic ceased, and the curds disappeared from the vomited matter and from the stools. On this formula the child first began its steady improvement which has since continued. In another case, occurring under our observation in the service of the same hospital, the patient, a colored child of six months, with

symptoms of advanced marasmus, was first given a modification consisting of :

Fat,	3 per cent.
Sugar,	6 per cent.
Proteids,	5 per cent.

On this diet the patient began to improve, and later the proportions were gradually changed to :

Fat,	7 per cent.
Sugar,	6 per cent.
Proteids,	1 per cent.

On this diet the infant did remarkably well, later developing into quite a healthy child. It would seem probable that the reason for the high percentage of fat being borne so well was the strong element of rachitis which existed in this case.

Both fats and albuminoids can be gradually increased as the infant's powers of assimilation grow stronger. In older infants good results sometimes follow the careful and gradual substitution of modified milk in place of the breast milk where the infant has previously been kept on this diet. Indeed, not infrequently the patient will do better on a carefully modified milk than upon breast milk, where the quality of the latter is poor. It is a mistake to suppose that the mother's milk is always, and under all circumstances, the best food for the child.

Where the disease is accompanied by constipation, the diet can be supplemented by small quantities of extract of beef, beef juice, or, what is often better, beef peptonoids, and in older children, in some cases, by very small quantities of dextrinized foods, preferably one of Liebig's.

Massage of the whole body, and especially the abdomen, has proved itself a most useful adjunct in the treatment of the constipation which not infrequently accompanies acute atrophy. The action of the digestive apparatus can be strengthened by suitable doses of strychnin, or better, the tincture of nux vomica. Flushing out the intestines with a one per cent. solution of sodium chlorid is also of great use. The injection should be given from a fountain syringe and always through a rubber catheter so as to allow the water to flow as high up in the large intestine as possible. Occasionally gastric lavage is of use. The administration of olive or cod-liver oil by the mouth is generally

contraindicated on account of the patient's weak digestion. Good results will, however, follow inunctions of oil given in the same manner as has been described under the treatment of other forms of intestinal disease.

An emulsion of raw egg with olive oil, the formula of which has been before given and which was introduced into the out-patient dispensary service of the Polyclinic Hospital by Professor Edward P. Davis, will often prove efficient. Great care, however, must be used to keep the patient from getting a too large quantity of fatty foods. Cleanliness and fresh air are absolutely essential to well being of these patients. Rock-salt baths, or, where possible, a daily sponging with cool sea-water, are valuable aids toward cure. The child should be taken in its coach or in the nurse's arms in the fresh air every day for two or three hours if the weather permits. Sea air we have found to be of especial benefit. Where the mother's milk seems to be at fault, an analysis should be made, and if it be found deficient in nutritive elements, efforts should be instituted toward enriching it; this subject has been treated at length in previous chapters on infant feeding.

DIABETES MELLITUS.

Diabetes mellitus, also called saccharine diabetes or glycosuria, is a constitutional disorder of the elaborative functions of nutrition, characterized by a persistent and excessive secretion of saccharine urine, great thirst, excessive appetite, rapid emaciation, and an early fatal termination.

Causes.—Heredity, and especially an inherited lessened capacity for the digestion of the carbohydrates, seems to play a large rôle in its etiology. The disease is apt to be a legacy from a neurotic or gouty ancestry. Long-continued dietetic errors, by deranging the processes of nutrition, may predispose to it. Exposure to cold, traumatism, acute infectious diseases, climate, syphilis, and malaria, disorders of the liver and pancreas, all seem to assume an etiologic relation. Its frequency among Jews is remarked by all writers.

Morbid Anatomy.—No constant lesion is present in diabetes; those encountered are usually consequences, rather than causes, of the disease. The pancreas has been found to be the seat of disease in a large proportion of cases, the conditions observed being atrophy, fatty degeneration, suppuration, and fibrous inflammation, concretions, cysts,

and tumors of this organ. Complete extirpation of the pancreas in animals always produces diabetes, while partial removal or ligature of the duct is not followed by such a result (von Mehring and Minkowski). These experiments suggest that it is the function of the pancreas to control metamorphosis of sugar in the body. It has been suggested (Lepine) that the pancreas produces a ferment which is necessary to the normal metamorphosis of sugar. The liver is often enlarged and fatty; cirrhosis and pigmentary degeneration have been observed. The lungs often present evidences of tuberculosis. The kidneys in many instances are diseased.

The infrequency of diabetes in childhood is to be explained by the activity of the nutritive processes in early life. No theory, physiologic, pathologic, or chemic will explain all cases of diabetes. It is known that it sometimes follows diseases and traumatism of the central and peripheral nervous systems. Physiologic chemistry has demonstrated that glycogenesis is sometimes the result of interruption in the metabolism of the carbohydrates; sometimes an inexplicable derangement in the metabolism of the nitrogenous elements of food. The relation of diabetes to the glycogenic function of the liver is still undecided; some maintain that it arises from the arrest of the carbohydrates in the liver, or from the arrested or perverted glycogenic function of the liver, so that sugar is poured into the circulation and causes diabetes. Others maintain (Pavy) that the liver is a sugar-destroying and not a sugar-forming organ, and claim that the carbohydrates are partly converted into fat in the intestines and partly into glycogen in the liver, and that diabetes results from the overloading of the circulation with sugar through a failure of these functions. From a chemic point of view it is essentially a disease of suboxidation of the elements of food—nitrogenous as well as non-nitrogenous.

Symptoms.—The disease in children differs from its course in adults chiefly in its more rapid, often sudden, development, and in its early fatal termination. The child, in spite of excellent appetite and ample food, grows thin and emaciated, the skin becomes dry and toneless. Thirst and appetite are excessive. There is a frequent desire to void urine, which is passed in large quantities and upon examination is found to be usually of high specific gravity, marked acidity, and to contain sugar. The amount of urine may vary from 1500–6000 c.c. in twenty-four hours, the specific gravity from 1018 to 1040, the pro-

portion of sugar from three to ten per cent. Peevishness, restlessness, itching of the genitalia, constipation, and sensitiveness to cold are other symptoms frequently observed.

Diagnosis.—A recognition of the persistent presence of sugar in the urine determines the diagnosis. A careful examination of the urine should be made in all cases of polyuria or incontinence. For the detection of sugar in the urine the tests most commonly employed and reliable are Fehling's, Böttger's, and the fermentation test. Whenever possible, it is desirable to examine a portion of the entire quantity of urine passed in twenty-four hours—where this is not obtainable, a specimen voided two to four hours after a meal is most likely to show the presence of sugar when the amount is small.

Fehling's Test.—For *qualitative* testing, take one c.c. of the test solution and dilute it with four c.c. of water; boil this, and if no precipitate occurs and the solution remains clear, it is fit to be used; if not, a fresh solution should be obtained. To the test solution, after boiling, add the urine, drop by drop, until a bulk equal to the amount of test solution has been added; if no yellow or red precipitate takes place, sugar is absent.

An approximately accurate *quantitative* test can be made with Fehling's solution employed as in the foregoing test if it is remembered that an equal amount of urine which exactly removes the blue color from the test solution contains $\frac{1}{2}$ of one per cent. of sugar. If the color is removed by an amount of urine equal to half of the bulk of the test solution, that urine contains one per cent. of sugar; if the amount of urine necessary to remove the color from the test solution amounts to twice the bulk of the test solution, it contains $\frac{1}{4}$ of one per cent. Urine containing a large percentage of sugar should be diluted in the proportion of 1 to 9 of water, and the diluted urine employed in testing for sugar; the result obtained should be multiplied by ten.

Böttger's Test.—If albumin is present, it should first be removed by boiling and filtration. To five c.c. of urine add five c.c. of liquor potassæ and a few grains of subnitrate of bismuth, and boil; if sugar is present, it will reduce the salt of bismuth to black metallic bismuth.

The Fermentation Test.—This serves the double purpose of a quantitative and a qualitative test. Fill a four-ounce bottle with the urine whose specific gravity has been determined. To it add a piece of compressed yeast, the size of a bean, or a teaspoonful of brewer's yeast;

mix thoroughly, and stand in a warm place (70° to 80° F.) for twelve hours or longer. At the expiration of this time the sugar will have been converted by fermentation into carbonic acid and alcohol and the specific gravity lowered. For every degree lost in specific gravity there is one grain of sugar to the fluidounce. Thus, if the original specific gravity is 1040, and after fermentation 1020, there are twenty grs. of sugar to the fluidounce. From this the percentage may be ascertained by multiplying the number of degrees lost by .23. Thus, in urine losing twenty points in specific gravity, the percentage of sugar would be 4.6 per cent.

Prognosis.—Diabetes in children is essentially an incurable disease; the younger the patient, the worse the prognosis.

Treatment.—In children diabetes does not permit of classification as it does in adults, in whom we recognize at least two forms of the disease. No recoveries from true diabetes in children have been reported. The hygienic treatment is important. Patients should be protected by proper clothing from cold, which is their worst enemy. Frequent bathing should be employed, and should be succeeded by brisk friction to keep skin and circulation active. Guard against chilling, constipation, and excessive acidity of the urine. Out-door life and muscular exercise, always short of fatigue, should be insisted upon. In the matter of diet the aim should be at the exclusion of the carbohydrates to diminish the glycosuria and polyuria. The attempt at absolute exclusion will be found useless or impossible, as the chief substitute for ordinary bread, the so-called gluten bread, usually contains a varying amount of starch. It is probably more advantageous to permit a small amount of ordinary bread or crusts of bread and bran bread, the amount being determined by its effect upon sugar excretion, than to allow a large amount of gluten bread with its uncertain amount of starch. Cakes made of almond flour from which the sugar has been removed, and cakes of inula, as well as preparations made from various other flours, as poluboskos and soy-bean flour, may prove of temporary benefit, but none of them will still the craving of the patient for "the staff of life"—ordinary bread. Saccharin, glycerin, and levulose may be used as sweetening agents.

The **medicinal treatment** does not present much encouragement. Aside from opium preparations, which are the only drugs capable of checking the disease in most cases, there is no drug which distinctly

influences its progress. Codein produces the least systemic disturbance, but is not so effective as the extract of opium, which of all preparations is the best. It should never be given in sufficient amount to produce narcosis. Arsenic is useful in mild cases, but unfortunately we do not meet them in children. Fluid extract of ergot in full doses is sometimes helpful. Treatment by thyroid, thymus, and pancreatic extracts internally and subcutaneously has not met with success. Fluid extract of jambul, used extensively in India, has proved another disappointment. Strychnin, laxatives, and cod-liver oil are useful to meet symptoms. Alkaline waters are beneficial and should always be employed when there is an excessive acidity of the urine, thus warding off an attack of coma. Salicylate of soda in rheumatic cases has obtained some reputation for its beneficial effect upon diabetes.

CHAPTER XIV.

DISEASES OF THE HEART.

GENERAL CONSIDERATIONS.

Anatomy.—Normally, within the first ten days after birth, the circulation may be said to wholly lose its fetal type and assume extra-uterine characteristics. The changes occur at slightly variable periods. They include: The conversion of the ductus arteriosus and ductus venosus into fibrous cords; the closure of the foramen ovale; changes in the umbilical veins and umbilical arteries, the first forming the round ligament of the liver, the second the true anterior ligament of the bladder and the superior vesical arteries.

In the early weeks of postuterine existence one may clearly see the remnant of the Eustachian valve, and though the foramen ovale is closed, yet it is distinctly outlined. Variations in the weight of the heart at different ages are shown in the following table of Boyd:

AGE.	GRAMS.
At birth,	20.6
One and one-half years,	44.5
Three years,	60.2
Five and one-half years,	72.8
Ten and one-half years,	122.6
Seventeen years,	233.7

The relative weight of the organ is greatest at birth, and the right side predominates to a slight degree over the left. In infancy and early childhood the long axis of the heart is more horizontal in the thoracic cavity than it is in later life.

Physiology.—Independent of its nervous mechanisms the cardiac muscle appears to possess a property of rhythmic contractility. The controlling influence of the nervous system is of extreme importance, however. Ganglia and plexuses are found in the heart, the former

being inhibitory or augmentory in function. The center for the extrinsic controlling mechanism lies in the bulb, inhibitory impulses passing from it down the pneumogastric nerves, and the majority of the augmentor impulses passing down the spinal cord, and to the cardiac plexuses through the medium of the sympathetic system.

Inhibition is undoubtedly nature's method of conserving tissue and energy (anabolism) and the inhibitory centers are constantly active. Augmentation is synonymous with catabolism.

Though our knowledge of these central agencies is far from perfect, yet they cast many important side-lights upon the functional cardiac disturbances in children, and it seems clear that rational treatment depends largely upon this physiologic knowledge.

Examination of the Heart.—Though the heart lies so superficially in the young subject, so rapid is the rate and so frequent are the variations in rhythm that a satisfactory examination may be extremely difficult. A careful pursuance of the various steps of inspection, palpation, percussion, and auscultation is always more or less fruitful of results.

We can scarcely avoid mention of an old mode of examination to which Benedict has redirected attention in a recent paper. We refer to combination of the last two methods, or *auscultatory percussion*. This method has been frequently applied in outlining the gastric viscus, but not until lately have we been enabled to demonstrate its value in mapping out the size of the human heart. Only the *deep* or "relative" cardiac dulness can be studied thus, but as this is the area which tells us most surely of the cardiac bulk, nothing is lost. The lightest immediate percussion will serve in this study. This is especially important in children whose tissues are so much less dense than those of adults.

The phonendoscope is of special value in auscultatory percussion, and in listening to the sounds of the heart through clothing. It usually interests rather than annoys the child who is being examined. We would not, however, recommend the student to depend *wholly* upon instruments which amplify sounds, but to religiously train his ear by studying cardiac sounds with the intervention only of the examining towel. Thus only can the quality of sounds, their rhythm, force, intensity, be fairly compared.

Starr prefers to inspect and auscult before resorting to the more disturbing methods of physical examination.

The following aphorisms are drawn from Crandall:

1. The apex lies higher in the chest and farther to the left than in the adult.
2. The apex-beat is hard to detect in the infant. In the child, palpation shows this easier than in the adult.
3. The area of dulness is comparatively large. (Rotch indicates three stages in infancy and childhood during which differences are noted in relative and absolute dulness.)
4. Murmurs are heard over comparatively large areas. A study of differences in the quality of the sounds will help us here.
5. The rate may be increased and the rhythm altered by slight causes.
6. In rachitic children and in those affected by empyema or pleural adhesions, the apex may appear in an abnormal position.
7. Prominence of the precordia is sometimes marked.

The examination should always be performed during sleep, or in a state free from physical or psychic disturbance, and a child should never be frightened with a formidable-looking stethoscope or other instrument.

CLASSIFICATION OF CARDIAC DISEASES.

TIME OF OCCURRENCE.	NATURE OF THE AFFECTION.	CLINICAL DISEASE.
Intra-uterine existence or very early infancy.	Developmental or Inflammatory.	Various congenital affections.
	Various motor or sensory phenomena, unaccompanied by sensible changes of structure.	Functional diseases of the heart.
Extra-uterine existence (infancy or childhood).	Organic { Mechanical.	{ Dilatation } Alone or as accompaniment of inflammatory change.
	{ Inflammatory.	{ Hypertrophy } Pericarditis; acute or chronic.
		{ Endocarditis; acute or chronic.
		{ Myocarditis; acute or chronic.
	Miscellaneous.	{ Effusions (non-inflammatory).
		{ Granulomata.
		{ Neoplasms.

CONGENITAL DISEASES OF THE HEART.

To the embryologist and the pathologist these lesions are of considerable interest. To the practical clinician very little importance attaches to them, because exact diagnoses are usually impossible and manifestly our best therapeutic measures are often utterly useless.

Hirst, following Baginsky, adopts the classification below appended :

1. **Patency of the Foramen Ovale.**—This lesion is of slight importance, unless accompanied by a marked defect of the muscular wall.

2. **Defect of the Ventricular Septum.**—Absence of this structure causes the *cor triloculare*. Frequently the auricular septum is also absent and we have the *cor biloculare*.

3. **Anomalies of the Auriculoventricular Valves.**—These are much more common on the right side of the heart. Such lesions may be inflammatory (sclerotic endocarditis) or contractions may follow at the sites of small hematmata (Rotch). More rarely the valves are bound together, forming an annular diaphragm, and in exceptional cases atresia of the orifice may be found.

4. **Stenosis and Atresia of the Pulmonary Artery.**—Stenosis of this vessel is the most common and the most important congenital affection, for, unless some sudden strain be thrown upon the heart, such cases may reach adult life.

The lesion may be due to intra-uterine endocarditis, or it may be developmental. Complete atresia is exceedingly rare. Obviously, the blood-supply to the lungs would be materially restricted. Thus, one is not surprised to learn that many of these cases perish from pulmonary tuberculosis. Subsequent valvulitis is also to be expected. Stenosis of the conus arteriosus is occasionally observed.

5. **Persistence of the Ductus Arteriosus.**—Absence of this vessel has been observed. The obliterative endocarditis (Warren) by which this structure becomes closed may involve the isthmus aortæ.

6. **Stenosis of the Aorta.**—Stenosis of the aorta is much less common than the similar condition of the pulmonary artery, and is inversely of more serious potentiality. Complete atresia may exist, and, as in deformities of the right side of the heart, the conus arteriosus may be stenosed.

7. **Transpositions of the Arterial Trunks.**—These cases,

which may be observed alone or in connection with other visceral transpositions, rarely live to term.

8. **Numerical Anomalies of the Valve Segments.**

9. **Gross Anomalies.**—Acardia; ectopia cordis; displacement upward or downward; ill-developed heart; bifid apex; absence of pericardium, etc. These anomalies may accompany other gross developmental malformations, such as spina bifida, or hydrocephalus.

Symptoms.—Cyanosis is present in about ninety per cent. of cases of congenital deformities of the heart (Osler); it usually appears early, but in a case seen by us at Blockley, it was not present until a few hours before death. The blueness may be quite general, or may appear only in the lips, nose, eyes, fingers, and toes. Peripheral temperature is lowered. Dyspnea and cough are common symptoms. Such children are always puny of body and stunted in mind. The fingers are markedly clubbed. The child fails to develop generally.*

Diagnosis.—The diagnosis of the exact condition is impossible in most cases, yet when cyanosis, cardiac hypertrophy, and murmurs are present, one can safely say that there is congenital cardiac disease present.

A diagnosis of congenital heart-murmurs has been made, the child still in utero; while in the Blockley case (mentioned above), the antemortem diagnosis was croupous pneumonia, whereas it was *cor triloculare*.

Murmurs alone are notably misleading. *Right-sided hypertrophy*; a *thrill* in the upper chest; a *systolic murmur* at the pulmonary cartilage (with absence of the transmission into the arterial trunks), would lead to a diagnosis of pulmonary stenosis.

Prognosis.—This is grave in the majority of instances. A patulous foramen ovale is not incompatible with life, and sixteen per cent. of the cases of pulmonary stenosis reach the age of twenty years (Assum).

Treatment.—This is essentially hygienic. "If," as Jacobi says, "they be so unfortunate as to grow up, exercise should be avoided." Warm clothing and a mild, equable climate will serve to prevent the internal congestions and the bronchitis, which may serve as fatal disturbances to a damaged and overlaid circulatory apparatus.

* See chapter on Physical Development.

Tonics will be of use as indicated, and digitalis may prove of service in crises.

FUNCTIONAL DISTURBANCES OF THE HEART.

During the developmental epochs the heart is especially liable to disturbances of rhythmic action, but infants, as a rule, escape; older children are thus troubled, however, especially as puberty approaches, and during and after that time. Exciting causes, such as confinement indoors, a sedentary or overlaborious life, the use of improper food, tea, coffee, or tobacco, readily affect the growing tissues of so delicately poised an organ; also the effect of poisons of various sorts, as the acute infectious fevers.

These affections are practically neuroses, and are not accompanied by demonstrable changes in structure; hence, are thus designated functional.

Wilson classifies the symptoms in the following table:

A. Motor-disturbances:

1. Derangements of rhythm.

(*a*) Arrhythmia; (*b*) Tachycardia.

2. Momentary syncope.

B. Sensory disturbances:

(*a*) Heart consciousness; (*b*) Distress; (*c*) Pain.

C. Motor and sensory disturbances combined.

Palpitation.—Obviously this is but a classification of symptoms and throws no light upon the existing conditions upon which these symptoms are dependent. Indeed, arrhythmia may be noted in perfectly healthy children during sleep, and, as before mentioned, the cardiac rate may be affected by trivial circumstances. On the other hand, some of these symptoms may be observed in organic heart or brain disease. We would recall attention to our brief summary of the physiology of the heart. It has been found experimentally that the rate, the force, and the rhythm may be affected by: The condition of the cardiac muscle; the states of activity of the intrinsic and extrinsic nervous centers; the blood pressure; the degree of ventricular distention; acids and alkalies in the blood; the temperature of the blood; the quality of the blood; local heat and cold; drugs; also reflexes from various localities.

Causes.—Anemia will be found as the most frequent cause of palpitation, etc. ; tea and coffee drinking are far from uncommon factors of disturbed cardiac rate and force ; exophthalmic goiter is occasionally observed in childhood ; so various disorders of metabolism with circulatory toxins are competent causes. Eye-strain, dyspepsia, and nasopharyngeal growths will serve as examples of reflex causes.

Paroxysmal tachycardia, so thoroughly studied by Nothnagel, we have not observed. It must be remembered that many of the reported cases have displayed organic lesions of the heart or nervous mechanism, and one should look carefully for such lesions before regarding such individuals as subjects of neuroses only.

Sansom reports 100 cases of influenza, with tachycardia in 37 cases, irregular heart in 25, and bradycardia in 5 cases. Our experience amply confirms the influence of the influenza poison upon the circulatory apparatus. Increase or slowing of the rate and abnormalities of rhythm frequently persist for a long time as resultants of this infectious disease. The irregularities in cardiac action so frequently seen accompanying chorea, and which often pass away, leaving apparently no lesion, are in all probability instances of slight endocardial damage. These may not recur, but are too often the initial lesion, becoming subsequently serious and disabling.

Diagnosis.—Our physiologic knowledge of cardiac structure, action, and normal variations should lead us to investigate etiologically, and not rest content with the diagnosis of a symptom. Our observations at the Polyclinic Hospital would lead us to believe that Da Costa's classification applies to children, and that many cases may be grouped under the heads of *muscular weakness* or *nervous weakness* of the heart. Of course, these conditions may be accompanied by general asthenic states.

Prognosis.—This will depend upon the gravity of the underlying conditions. As a rule, prognoses are decidedly favorable when organic cause is excluded.

Treatment must also depend upon the cause, or causes, of the symptom. In most cases it is largely hygienic. Attention to diet is always called for, as reflexes arising through the pneumogastric nerve—for instance, those from a dilated stomach—may mechanically influence the heart. If syncopal seizures are noted, the child must be kept in bed, and there treated by massage, proper bathing, and a concen-

trated nutritious diet. Iron and arsenic used judiciously are of value in anemia. When the first sound of the heart is weak, or when tachycardia is accompanied by syncope, strychnin in small divided doses is our best remedy.

Hygienic measures are of most practical utility, including attention to the skin, lungs, bowels, and digestion, especially intestinal digestion and absorption, and careful regulation of the bowels, avoidance of auto-intoxication from defective elimination.

The Bad Nauheim (so called Schott) method of systematic bathing and of exercise against gentle resistance would seem to find its widest field in such cases. Where the heart has been crippled by organic disease, we can not see that such good results can be produced. We would certainly regard the more severe exercise of mountain-climbing as hazardous in the extreme in organic cases, and only to be approached by easy gradations and carefully supervised in any case. Gentle, largely passive but always carefully regulated exercises will, if unaccompanied by excitement, prove of the utmost value, steadying the ebb and flow of the blood and increasing the general tone, as well as the nutrition, of the heart muscle.

ORGANIC CARDIAC DISEASES.

Pathology.—It is customary in works upon pediatrics to rest content with the statement that the pathologic changes do not differ from those observed in adults, but as the early periods of life so often mark the inception of these dangerous morbid processes, a concise review of the morbid anatomy will not be amiss.

Sturges is inclined to speak of carditis, believing that in severe cases the morbid changes are not confined to endocardium or pericardium, but that these structures share with the heart muscle in a common pathologic process. As Crandall remarks, however, "these cases (of Sturges) came to autopsy," and we can not feel certain that such diffuse lesions exist in all cases. Certainly disease of one or the other may predominate, just as the croupous pneumonia may far outweigh the small amount of pleuritis that accompanies it.

Pericarditis.—We may divide this into plastic pericarditis, pericarditis with effusion, and adherent pericarditis. The changes involved may be only different stages of one morbid process. On the

other hand, plastic pericarditis may cease as such. Effusion may come on insidiously. Purulent pericarditis probably partakes of a purulent nature from the very onset. Adhesions may result in essentially chronic cases, in which there has been no suspicion of the process.

In plastic pericarditis the internal or external surfaces of the membrane may be affected, and the changes local or general. In the mildest cases the membrane is simply devoid of luster, due to a light coating of fibrin. The fibrin may be present in such large amounts that the "hairy heart" (*cor villosum*) is produced. Some serous exudate is always found between the meshes of the fibrin. Many of these cases are tuberculous, the fibrin covering the small tubercles (Osler). If resolution occurs in this plastic stage, white spots are seen occasionally to dot the serous surface. The exudate may be simply serous, containing floculi of fibrin and endothelial cells. This is the common form of effusion in rheumatic endocarditis. Again, the fluid may be purulent, either because of extension from the contiguous mediastinal glands or pleura, as a manifestation of a pyemic process, or as a primary occurrence (local tuberculosis). When the fluid is bloody, the probabilities are that the affection is tuberculous.

Adhesions may form between the two surfaces of the membrane (local or general), or extrapericardial adhesions may be present.

Myocarditis, an inflammation of the muscular tissue of the heart, results whenever pericarditis is well marked. For a depth of two to three mm. the muscle may appear quite pale (Osler). Affections of the cardiac muscle have not been well studied in childhood. One need scarcely more than allude here to the common forms of dilatation and hypertrophy, whether these lesions occur independently or are accompaniments of valvular, pericardial, kidney, or pulmonary disease.

In pneumonia and diphtheria cloudy swellings may be found, and in typhoid fever a true myocarditis may be present. Tubercle and syphilis rank as uncommon affections.

Sarcomata of the heart are exceedingly rare.

Endocardial changes may also accompany the aforementioned process, or occur without either. Micro-organisms may be found in lesions of the lining membrane, but if one exclude the pneumococcus, a direct relation of these bodies to the morbid changes can not be positively asserted. Inflammation attacks most frequently the valvular

endocardium (in intra-uterine life, the tricuspid, and in postnatal existence the mitral leaflets being the preferred sites of disease).

The changes resulting are spoken of as verrucose (warty), ulcerative, or sclerotic; but, as in pericarditis, we can draw no sharp pathologic or clinical lines.

The changes occur two to three mm. from the free margins of the leaflets (Osler)—*i. e.*, at the lines of maximum contact (Sibson). In the verrucose (warty) form small bead-like bodies or larger granulations are observed. These represent newly-formed vascular tissue infiltrated with endothelial cells and capped by cellular debris and fibrin. Micrococci are present in ulcerative forms (Eberth and Klebs), but are known to bear no constant relation to the simple forms. These changes commonly pass into a sclerotic phase, with the tendency to contraction noted in scar-tissue generally. Should the deformity resulting narrow the valve orifice and offer resistance to the normal flow of blood, we speak of stenosis; should the valve leaflet fail to meet its fellows in closure, back flow or regurgitation would occur. Sclerosed valves are likely to be the seats of recurrent inflammations.

More rarely, indeed, very rarely in childhood, the warty granulation undergoes rapid disintegration, the necrosed tissue is swept away, and ulceration or malignant endocarditis manifests itself. Such an ulcer may completely perforate a valve. Emboli are sometimes carried along into the circulation in the various forms of endocarditis, and the resulting phenomena observed in distant parts will vary according to the structures involved and the septic or non-septic characters of the debris.

DISEASES OF THE PERICARDIUM.

PERICARDITIS.

Inflammation of the serous envelope of the heart may occur, with or without muscular or endocardial involvement. It is properly considered a disease of the heart. Large effusions are more likely to occur in children than in adults.

Etiology.—Pericarditis is rarely primary, though it is true that

the pericardium may be wounded from without, and that foreign bodies may ulcerate from the esophagus into the sac.

Rheumatism is the most frequent cause of secondary pericarditis, and the rheumatic affection may be so slight as to escape attention. Septic infection of the umbilicus ranks as a prominent cause in early infancy. Tuberculous forms of pericarditis are much more common than is usually supposed. Scarlet fever is occasionally the essential factor, and Pepper and Deaver report a case following influenza. Extension of inflammation from contiguous organs occurs in a number of cases (pleuritis, mediastinal abscesses, pleuropneumonia).

Pericarditis may occur at any age, and males are more frequently attacked than females (Osler).

Symptoms.—Very frequently in *plastic pericarditis* the condition is not suspected during life. Pain referred to the precordia or to the xiphoid cartilage may or may not be present. There may be left pleurothotonos—a bending of the body to one side. The pulse is usually free and rapid. Slight fever is common, and a hacking cough is often present. If effusion should form in any considerable amount, sharp or stabbing pain may be complained of, or the patient simply experiences a sense of discomfort in the precordial region. Here tenderness at the lower sternum may be coupled with the pain. Dyspnea is common, and should always demand a careful examination of the heart and lungs. The face may be dusky and the expression anxious. The patient is restless; the pulse is rapid, small, is sometimes irregular, and the *pulsus paradoxicus* (failure of the pulse during inspiration) may be observed.

Pressure on the recurrent laryngeal nerve, when present, causes aphonia, or the left lung may become physiologically hampered from the pressure exerted.

Syncope, hiccup, insomnia, and low delirium are present in the more severe cases; or marked cerebral symptoms may manifest themselves in the hyperpyrexia of rheumatic sufferers.

Effusions may come on insidiously, and with practically no symptoms; if abundant, cyanosis and orthopnea may be graphic features.

In adherent pericardium the symptoms are uncertain and indefinite (Osler). The affection may not be suspected until a careful physical examination demonstrates great cardiac enlargement.

Physical Signs.—*Inspection* reveals an overacting heart in the

plastic form of pericarditis. When effusion takes place, the precordia bulges, the intercostal spaces become prominent, and edema of the thoracic wall may be observed (especially when pus is present). The displaced viscera of the abdomen may produce a prominence in the epigastrium. Systolic retraction at the apex, diffusion of the apex-beat, and Friedreich's sign (diastolic collapse of the cervical veins) are of diagnostic importance in adherent pericardium.

Palpation may reveal a distinct fremitus in simple pericarditis. As effusion progresses, the cardiac impulse becomes weakened and finally lost. The apex-beat seems displaced upward and outward, though this is probably apparent and not real (Rotch). At the same time the pulse may be quite forcible. Fluctuation can rarely, if ever, be detected (Osler). When adhesions form, systolic retraction can, in some instances, be felt at the apex, and a diastolic rebound may follow it.

Percussion.—In simple pericarditis or commencing effusion we can expect to find nothing but dulness. As the fluid exudate increases, the precordial area of dulness becomes much enlarged, assuming a pear-shaped type with the base directed downward and its apex toward the manubrium. Rotch lays great stress upon the enlargement to the right of the sternum, considering this quite diagnostic. Sansom finds a small posterior area of dulness important.

Auscultation.—Most pathognomonic of plastic pericarditis is the historic friction sound. It is a to-and-fro or double sound, corresponding to systole and diastole, but outlasting these periods. Its superficial character is quite distinctive. The sound usually possesses a rubbing or grating quality, but may simulate the creaking of new leather (*bruit de cuir neuf*). It is usually present over the right ventricular area, but may be noted at various sites. It may simulate certain valvular murmurs, but does not follow the laws of transmission. When fluid appears in quantity this sound usually disappears, or is heard only in certain limited areas. With the absorption of fluid it may reappear. In large effusions, auscultation over the left lung may reveal feeble or tubular breathing.

In chronic adhesive pericarditis a loud systolic murmur may lead to an error of diagnosis. On the other hand, murmurs are sometimes absent. The fetal rhythm is heard when marked dilatation is present.

The pleuropericardial friction is a duplex phenomenon in which sounds accompany the respiratory as well as the cardiac movements.

Diagnosis.—In cases of frank articular rheumatism, where the heart is examined daily, the onset of pericarditis should not be difficult to recognize. But rheumatism is too frequently insidious in the child, pericarditis complicates other affections, and as the pericardial inflammation may give rise to very little disturbance, the affection is often overlooked. When effusion is excessive, or when extensive adhesions cripple the heart, the diagnosis may be most difficult.

Cardiac dilatation or hypertrophy, from any cause, may be most difficult to distinguish from pericardial effusion. That, in the course of time, the Röntgen rays will prove of the greatest value in the differentiation of these two conditions, we can but feel assured. A weak or absent apex-beat, coupled with a strong pulse, would strongly suggest effusion. Again, the shape of the dull area is of great importance, being increased in all directions,—in the majority of instances in the form of a pear.

The double murmur of aortic valve disease may simulate a friction sound.

The systolic murmur in adhesive pericarditis may be difficult to tell from a valvular murmur. A study of transmission and quality over various portions of the chest will here enable us to differentiate. Lastly, certain cases of massive effusion may be most difficult to diagnose, as they simulate, even to the tubular breathing, left-side pleural effusion.

Where purulent pericarditis is suspected, diagnostic puncture should be performed.

Prognosis.—This depends largely upon the etiologic factors, and upon the amount of effusion and whether it be serous or purulent. In rheumatic pericarditis, the immediate outlook is usually good, though these cases with large effusions may die suddenly or the heart be subsequently crippled by adhesive bands. In septic or purulent pericarditis, the prognosis is most gloomy. Tuberculous pericarditis, though slower in its course, also terminates fatally.

Treatment.—In acute pericarditis, the child must be kept at absolute rest in bed, and free from all psychic disturbances. This condition of physical and mental quiet must be maintained for weeks or months. Locally, dry cold should be applied, as this suffices to

lessen the cardiac rate. Heat (dry or moist) may supplant it in certain times and cases. The diet should be simple and concentrated, peptonized foods being demanded where there is gastric disturbance; all gaseous distention must be promptly relieved. The systemic treatment will depend somewhat upon the accompanying and causative affection. In rheumatism, alkalies combined with the salicylates should be given, unless there is great depression. In septic conditions, active stimulation is demanded in spite of the pericardial complication. Morphia is the standby to relieve pain and great restlessness, though phenacetin (in small doses) may be useful in mild cases, and chloralamid or sulphonal will control restlessness when opium is not demanded. When the inflammation subsides and the effusion appears upon the increase, small blisters applied over the precordia at intervals of seventy-two hours are occasionally very useful. Calomel, alone or combined with Dover's powder, is a valuable agent here. Potassium iodid is vaunted in this affection. Caffein, spartein, or diuretin will find use in certain cases. Digitalis, strophanthus, and convallaria are to be used only when there is marked cardiac weakness.

In massive effusion paracentesis should be performed, either in the fifth interspace slightly to the left of the sternum, or, as Rotch suggests, to the right of the sternum. In serous effusion, aspiration will prove sufficient, but where pus is suspected, a surgeon should always be called, and in this grave affection we can not regard any hopeful operative measure as too radical. Epileptiform seizures or choreiform movements may appear during the operation of paracentesis.

OTHER AFFECTIONS OF THE PERICARDIUM.

Hydropericardium—(a collection of water within the pericardium) in the child is quite rare; it is most likely to occur in kidney disease and more rarely (unaccompanied by other dropsical symptoms) it is observed after scarlet fever.

Hemopericardium—(blood within the pericardium). The productive factors of this condition in adult life do not obtain in the child, though, as already mentioned, tubercle may be accompanied by sanguineous pericardial exudate.

Pneumopericardium—(air within the pericardium). This affection may be produced as in the adult, and differs in no way from the condition observed in adult life.

AFFECTIONS OF THE MYOCARDIUM.

Causes.—Hypertrophy and dilatation usually occur conjointly, and may result from excessive cardiac activity *per se*; mechanically, from extra cardiac adhesions; or as compensatory efforts in valvular disease. Nephritis is a cause of left ventricular *hypertrophy*. (See



FIG. 23.—ACUTE PARENCHYMATOUS NEPHRITIS AND HEMATURIA, SHOWING DECIDED LEFT VENTRICULAR HYPERTROPHY; AREA OF DULLNESS OUTLINED BY AUSCULTATORY PERCUSSION.

photograph No. 2.) Myocarditis usually accompanies endo- or pericarditis. The rarer affections of this muscle have been recognized pathologically.

Symptoms.—Those of myocarditis can scarcely be separated from the symptoms of accompanying inflammatory conditions. *Excessive dyspnea*, *cyanosis*, and *palpitation* would render that diagnosis probable. Dilatation and hypertrophy may or may not be accompanied by symptoms. Where the former condition far exceeds the latter (*eccentric*

hypertrophy) circulatory phenomena arise, which will be recognized as symptoms of failing compensation.

In syphilis or tubercle we should expect to find other symptoms or signs characteristic of one or the other disease.

Diagnosis.—The diagnosis of myocarditis is most often made first at the autopsy. Dilatation or hypertrophy must rest for detection upon the physical signs of cardiac enlargement.

Prognosis.—Even when marked damage seems to have been done, the prognosis in enlarged heart is usually good.

On the other hand, myocarditis is most marked in fatal cases.

Treatment.—For dilatation and hypertrophy, treatment should be largely preventive. Bicycle riding in a stooped position, and, indeed, excessive exercise of any kind may be a potent factor for ill. Before or around the age of puberty, boys should not be allowed to train for competitive athletic contests, as at this time the heart undergoes a rapid physiological hypertrophy. On the other hand, daily exercise in the open air, free from the objectionable element of *strain*, is to be highly recommended. More attention to body and less to brain will serve the average boy and girl best for future endurance, usefulness, and longevity. Where myocardiac inflammation is suspected, cardiac stimulants, such as digitalis, must be used, *if at all*, with the greatest care. Perfect rest, warmth to the extremities, iodid of potassium with bromids (Jacobi), and morphia will be useful here. In collapse, diffusible stimulants, such as camphor, ether, or alcohol, are indicated. Syphilis will demand its specific treatment.

ENDOCARDITIS (VALVULITIS).

Causes.—Rheumatism is far and away the most frequent cause of endocardial inflammation. Chorea is frequently accompanied by endocardial change, but here again the underlying cause is probably rheumatism in the majority of cases. Septic conditions give rise to endocarditis. Pneumonia and pleuritis are frequent causes. Scarlet fever is too often complicated by endocarditis; and diphtheria, measles, typhoid fever, and variola rank as occasional causes. Tuberculous endocarditis occurs. Endocardial changes may accompany acute or chronic nephritis. Carcinoma is so rare as to scarcely demand mention. Lastly, endocarditis recurrens, rather a frequent affection, is

worthy of attention. According to Crandall, girls suffer from rheumatism and consequent valvulitis much more frequently than boys. Endocarditis *may* occur in utero, but is rare under five years.

Clinical History.—Acute endocarditis may be cured, “really cured” (Jacobi), in the child,* but too often the acute inflammation



FIG. 24.—GIRL AGED ELEVEN YEARS; DOUBLE MITRAL DISEASE, AREA OF DULLNESS GREATLY INCREASED, ESPECIALLY OVER THE LEFT VENTRICULAR REGION.

ends in the sclerotic changes previously described, and we have the crippled leaflets of chronic valvular disease. This may never cause any inconvenience in the subject affected, for the muscular walls of the chamber or chambers, which must stand the brunt of strain, undergo a true hypertrophy.

* See Photograph No. 4.

Thus, in partial obstruction at the mitral valve, we should expect left auricular hypertrophy. In regurgitation at the same orifice, the left ventricular wall would share in the enlargement, for it must now exhibit force enough to send an increased amount of blood in two directions. This same ventricular wall would hypertrophy in the common combined lesion at the aortic valve. Where such hypertrophied muscle adequately performs its increased task, *compensation* has been effected. Now, if the heart-muscle of the left side fails to compensate fully, the strain comes upon the pulmonary system of vessels, and certain lung symptoms arise. The next tissue affected would be the right heart; and, lastly, the strain would manifest itself in back pressure upon the venous system. Fortunately, compensation is very readily effected in the child, and so even in grave endocarditis children may thrive surprisingly. We must not forget, however, that *recurrent* inflammation is common, and that during such recurrence some acute disease or some physical strain may serve as the immediate determining factor of *failing compensation*.

Practically, then, we have three clinical stages of endocarditis: (1) Acute inflammation, which may terminate in recovery, death, or chronic valvulitis; (2) Compensation (in chronic valvulitis); (3) Failing or lost compensation.

Symptoms.—The symptoms of acute endocarditis may be obscure or wholly wanting, so that a diagnosis is not made until permanent damage is done. When it arises in the course of an acute disease, as articular rheumatism, the temperature rises slightly (1° to 2° F.); the pulse-rate is increased, and the child is restless, with anxious expression. Pain and palpitation are rarely experienced. Cyanosis may appear, especially if the myocardium become involved (*vide supra*). The occurrence of fibrous nodules around joints is suggestive, though not pathognomonic. Advanced symptoms are seldom seen in the first attack. However, there are certain grave cases of rheumatic endocarditis which are attended by high fever, marked constitutional symptoms, and hemorrhages, thus making one think of ulcerative endocarditis (Litten). Lastly, ulcerative endocarditis itself is usually accompanied by marked cardiac disturbance, by a typhoid state, by purpura and hemorrhage from mucous membranes, and by the presence of embolic abscesses in various parts of the body. Fortunately this fatal disease is rare in childhood.

If, to meet the damage done, compensation is fully established, chronic valvular disease may be devoid of symptoms; but if compensation should be imperfect, some of the following symptoms are liable to be present: *Dyspnea* and *palpitation* are most common in aortic disease; *pain* is rarely present except in mitral stenosis; *typical ascending edema* is almost never seen in children, although *pulmonary congestion* is common enough; *epistaxis* is far from rare; *subacute bronchitis* and *persistent cough* are frequent accompaniments of chronic valvular disease. *Cyanosis* and *venous stasis* especially accompany mitral regurgitation.

Physical Signs.—Acute endocarditis is usually diagnosticated by the physical signs. Inspection shows a rapid and diffuse cardiac beat. Palpation confirms this observation and may reveal a strong, somewhat jerky or irregular pulse (*pulsus celer*). Percussion is at first negative, unless some precedent disease of the heart has induced a change in its volume. The signs of dilatation appear sometimes with astounding rapidity. On auscultation we may hear, usually at the cardiac apex, a large blowing systolic murmur or souffle. When we remember that the localized damage may be exceedingly insignificant, we are not surprised that physical signs occasionally fail us. Osler styles these signs "notoriously uncertain." In severe cases of ulcerative endocarditis, however, the physical signs are likely to be accentuated.

In chronic valvular disease, a careful and judicial study of physical signs is of the greatest diagnostic and prognostic importance. We have outlined certain limitations in the study of these conditions in an early chapter; we shall speak of others now, but these need not discourage us from carefully studying every case. The research is a more difficult one in children than it is in adults, but it is still a fruitful and imperative quest. We have no more patience with the diagnostic Nihilist, than with the therapeutic brother of the same negative type. The tools at hand are simple and effective in each instance; one has simply to acquire a practical knowledge of their judicious use.

We shall exclude *pulmonary stenosis* from our consideration here, as it is almost invariably a congenital affection, and has been described as such. There remain for our study: Mitral regurgitation, mitral stenosis, aortic regurgitation or double aortic disease, and tricuspid regurgitation.

Mitral Regurgitation.—The leaflets of this valve suffer most frequently from endocardial inflammation; and incompetency (producing regurgitation) is the most common result.

Inspection frequently reveals a bulging of the precordia. The apex-beat appears diffuse and may be displaced downward and to the left. The cervical veins may be distended and occasionally they exhibit pulsation. *Palpation* furnishes us with our best means of locating the apex-beat, and this is usually dislocated downward and to the left (Sansom). Pulsation may be quite general and diffused, felt over the whole left ventricular area, and usually over the right ventricular region.

One should mentally note whether such pulsations are weak and wavy, or forceful. A systolic thrill is sometimes present, as in any valvular affection, but thrill is much more common in mitral stenosis.

In no valvular affection does *percussion* reveal so broad an area of dulness as in well-marked mitral regurgitation. The dulness extends to the left beyond the nipple line, possibly to the axilla and to the right as far as the right sternal border or beyond it. But percussion should not be performed to ascertain the *size* of the heart alone; percussion reveals most when it informs us of the sizes of the various chambers of the heart (Sansom). Thus we are led, inductively, to the study of *auscultation*, which, though our most perfect method of exploration, is often but confirmatory of what the other procedures have already made clear. Now, murmurs are not always present in valvular disease, but, on the other hand, most murmurs in childhood are organic. One must study the point of *greatest intensity* very carefully, for the child's chest is so small that sounds are often widely diffused. The murmur of mitral regurgitation is almost invariably systolic in time, and the sound continues throughout the systole. It is heard best at the apex, though occasionally the base or mid-sternum may present the loudest sound. It is transmitted to the axilla and to the left scapular region. The quality may vary from a soft cooing murmur up to a harsh rasping or sawing character. We have plainly heard this murmur with the examining ear an inch from the chest. Double mitral disease is rather frequently observed.

Mitral Stenosis.—This affection is much less common than the foregoing lesion, though a considerable degree of stenosis may

accompany regurgitation. Mitral stenosis arises in insidious forms of rheumatism (Sansom; Crandall).

Inspection.—Pulsation may be observed over the upper chest upon the left side. (Osler states that this is due to right ventricular hypertrophy, no matter how far upward and to the left it may extend.) The apex appears normally situated or is removed but a short distance from its usual site.

Palpation reveals pulsation over the left auricular area and over the right heart. An apical presystolic thrill is quite common. This may be present at certain times and not at others. It is usually accentuated by an upright or bending forward position. In well-marked instances this sign is practically pathognomonic. Careful percussion reveals dulness, extending to the right and in an upward direction to the left of the sternum. Hypertrophy is seldom so marked as in double mitral disease or mitral regurgitation. The murmur of mitral stenosis is absolutely characteristic. It is of short duration, occurs during the presystolic or diastolic period, becomes rapidly intensified, and ceases with the systolic impulse. It corresponds in time to the described thrill. It is best heard at the apex or in the fourth interspace above. Ordinarily it is not transmitted to any degree, though Griffith has observed cases where this murmur was heard in the axillary region and back. Our studies have confirmed the statement that the area of the murmur is singularly restricted. Gallop or fetal rhythm is rather common in mitral stenosis. The murmur described above is singularly inconstant; it may be present at one time and not at another, so that too much prognostic expectation should not be founded upon its disappearance.

Disease of the Aortic Leaflets.—As alcoholism, excessive and continuous muscular strain, and acquired syphilis are rareties in childhood, the etiology of aortic disease must differ essentially from that of the adult. Excluding congenital cases, the disease is almost invariably due to rheumatism. In aortic regurgitation, inspection reveals the apex dislocated to the left and to a low point in the thorax. The apex has appeared as low as the eighth interspace in this disease. The precordia bulges markedly in the young child, especially over the left ventricular area. The arteries in the neck are seen to throb violently and the brachials exhibit the same phenomenon. Even the radials appear to alternately fill and empty most rapidly. The capillary pulse

is another phenomenon of aortic regurgitation. The ophthalmoscope reveals pulsation of the retinal arteries. Palpation confirms the suspicion of a downward dislocation of the apex-beat, and probably a throbbing sensation can be perceived over all the precordium. A thrill at the aortic cartilage or in its vicinity may be felt. The pulse is of the Corrigan or "water hammer" type. Percussion reveals a much enlarged precordial dulness (both absolute and relative) and the increase in the longitudinal diameter predominates over the lateral increase. (See Mitral Regurgitation.) The left ventricle may be alone affected, or all of the cavities may suffer alike from dilatation and hypertrophy (cor bovinum).

On auscultation over the affected heart one hears a diastolic murmur at the aortic cartilage (second right interspace). The sound is usually a soft bruit, long drawn out. Frequently it completely replaces the valvular click of the sound, though this is not always the case. It is transmitted down the sternum or toward the apex. A sharper murmur, systolic in time, may precede the regurgitant murmur, and is probably produced by roughening of the leaflets; for in these cases the valve orifice is so dilated that stenosis is out of the question.

Double Aortic Disease.—While regurgitation is not always accompanied by stenosis, yet marked stenosis is probably accompanied by leakage in every instance. Thus we deem it proper to speak of double or combined aortic disease. Of course, one or the other of the conditions may preponderate. Marked stenosis is exceedingly rare in childhood except as a congenital lesion. It is scarcely necessary to mention that we may have a combination of aortic, mitral, and tricuspid disease.

Inspection.—The apex-beat may be somewhat displaced, but not nearly so much as in the regurgitant lesion.

Palpation.—A somewhat forceful and disseminated beat is usually felt. A *thrill*, systolic in time, is decidedly characteristic. It is very marked over the base of the heart or at the aortic cartilage.

Percussion shows slight enlargement of the left ventricle (concentric hypertrophy) and mayhap also involvement of the right heart.

Auscultation.—Unless the systolic murmur is exceedingly shrill and harsh, unless it is heard best at the second right interspace and is transmitted into the large arteries of the neck and axilla, we can not be certain of aortic stenosis. The diastolic murmur is not always

present. (In a case recently seen at the Polyclinic Hospital the aortic sound of closure was perfect, and there was no murmur in diastole.) Sometimes a typical to-and-fro murmur is heard. (See Aortic Regurgitation and Pericarditis.)

Tricuspid Disease.—Regurgitation is the only lesion worth considering, as stenosis is nearly always congenital, and the patients thus affected soon die. Regurgitation at this orifice is primarily due to involvement of the left heart or to pulmonary disease, the right side suffering secondarily. It may occur in chronic bronchitis or in congenital bronchiectasis, and is accompanied by systolic pulsation of the cervical veins and pulsation of the liver. Signs of right cardiac hypertrophy are demonstrated by percussion.

Auscultation.—The murmur is heard near the lower portion of the sternum, is soft in character, and systolic in time. It may be impossible to distinguish it from the murmur of mitral regurgitation.

Diagnosis.—If in every case of rheumatism and in cases of infectious disease an examination of the heart should be made daily, the diagnosis of acute endocarditis would be secured more frequently. In pericarditis the friction sound should serve to differentiate. Cases of ulcerative endocarditis are frequently mistaken for typhoid fever; the diagnosis is a terrible one to make, and we should endeavor to exclude all diseases with similar symptoms. (In a case at the University Hospital miliary tuberculosis simulated ulcerative endocarditis.) In cases of chronic heart disease, physical signs, carefully weighed, will serve us in most cases. We must not rest content, however, with the diagnosis of a lesion, but must also appreciate the ratio between hypertrophy and dilatation, and must study carefully the general condition of the patient.

Prognosis.—In acute endocarditis the prognosis is usually good. In the severe recurrent types we must judge of severity by the amount of myocarditis and the intensity of the symptoms that have been detailed. In ulcerative endocarditis the prognosis is absolutely gloomy.

In *chronic cardiac disease* the quasi-scientific man blunders most miserably. Let him not assume that the presence of a heart murmur is necessarily of dark portent, nor that it should be used as a bugbear during the remainder of the patient's existence. Judge carefully of the amount of enlargement of the heart; try to estimate whether hyper-

trophy is present to a compensatory degree. Above all, do not forget that one is called upon to pronounce an opinion upon a patient and not upon a heart. Recurrent rheumatic attacks, poor hygienic surroundings, lowered nutrition, puberty, etc., are damaging factors. On the other hand, the maintenance of perfect nutrition and of perfect cardiac compensation may obtain for many years. The outlook, in the presence of good general conditions, is almost always bright for the child. It will be most unfavorable in aortic incompetency (especially if failing compensation be present), somewhat better in mitral stenosis, best in mitral regurgitation.

Treatment.—In acute endocarditis our first effort must be directed toward minimizing the amount of work done by the affected heart. Perfect rest to body and mind is, if anything, more important than in pericarditis. The child should be placed in bed and kept there, unless excessive fretfulness forbids, when the nurse's arms or a comfortable lounge may serve in good stead. The diet must be quite light and should be given in small amounts and at rather frequent intervals. Milk will prove the best food. If it produces flatulency, predigestion should be employed. The ice-bag to the chest will prove a useful local measure, especially if pain be present. Systemically, in rheumatic cases, we should use the salicylates, alone or combined with alkalies; for it is quite generally recognized that endocarditis is an incident and not a complication in the course of rheumatism. Jacobi lays great stress upon the use of potassium iodid. Phenacetin is also a capital drug, and, aside from its effect upon fever and pain, is probably anti-rheumatic. The bromids are useful to control restlessness. In serious cases, attended by great pain and restlessness, opium is again the remedy *par excellence*. Alcohol and cardiac stimulants are contraindicated in these simple cases. The bowels must always be kept rather freely open by the use of mild laxatives or of enemata.

In septic cases (ulcerative endocarditis) stimulants must be used with a free hand in spite of their local effects on the heart.

It is in chronic heart disease that ardent therapy may carry havoc in its path. These cases should be recipients of hygienic care as regards diet, bathing, exercise, and rest; and children should be guided into such life pursuits that the demands of physical efforts and strains are minimized. It will be well for every student to read Jacobi's sound advice in his most excellent book on "Therapeutics of Childhood."

If compensation be adequate, the heart needs no drug to whip it on to increased endeavor and consequent disturbance of balance. Some member of the family must be informed of the cardiac condition who will aid us in enforcing proper hygienic and other limitations. Lastly, each case must be judged on its own individual merits, and our efforts must be largely guided by results obtained. When the cardiac balance is disturbed, once more *rest* must be enjoined. Often this masterly inactivity alone will prove sufficient to reestablish the equilibrium so necessary to secure in such cases. Where cyanosis, dropsy, pulmonary congestion, or other serious symptoms arise, digitalis is far and away the best drug at our command. Use it irrespective of lesion, though it probably does best in mitral regurgitation. The infusion is a nice preparation, and may be given in doses of from twenty minims to one fluidram, according to the age of the child. Strophanthus may be used where symptoms of digitalis poisoning arise or where digitalis can not be given. Spartein, caffein, convallaria, nitrites, etc., are indicated in certain cases, but they are all vastly inferior to digitalis. Digitalis may be given for weeks, or even months, until compensation is restored. Iron will prove of great value during and after convalescence. Strychnin in small tonic doses is especially useful where the myocardium is weakened.

CHAPTER XV.

DISEASES OF THE RESPIRATORY ORGANS.

DISORDERS OF THE UPPER RESPIRATORY TRACT.

Diseases of the upper respiratory tract are common in children, and their early treatment is especially important, for when neglected, they may exert a disastrous effect on the health and development of the child.

As the treatment of many of these affections is largely surgical, it requires a special knowledge and training on the part of the physician. A description of the various operations and instruments, therefore, would be out of place here. It will be our endeavor, however, to give a brief description of the principal affections, with general suggestions for their treatment.

Causes and Pathology of Diseases of the Upper Respiratory Organs.—In a brief article on nasal diseases of infancy and childhood it is well to confine ourselves to generalities, and to mention merely the more important causes which produce the pathologic changes in the upper respiratory tract in children, and the immediate consequences of these pathologic changes in their effect on the growth of the nasal organs, producing a change of development in the whole system of the child.

Among the chief causes of nasal disease, and particularly of nasal obstruction, are infection from any source, want of cleanliness in early life, and climatic and temperature influences, causing the ordinary acute coryza of infancy. From whatever cause, the result is a swelling of the mucous tissues and an increased amount of secretion, in which the solid elements are abnormally abundant. This obstructive pathologic change necessarily interferes not only with the proper respiration, but also with nutrition of the infant, inasmuch as suckling

from either nipple or bottle is impossible when the nose is obstructed. If nothing is done toward reducing the swelling and inflammation within the nasal cavities, a state of subacute, and, later, of chronic inflammation and tumefaction of the turbinates ensues, and the normal development of the nasal organs is interfered with, and deformities result.

In order to understand this more thoroughly, we must remember that in the new-born there are four turbinated bones on each side, and that the vertical division (septum) between the anterior nasal cavities is entirely composed of cartilage, which gradually, as the child grows older, is displaced in its posterior portion by the perpendicular plate of the ethmoid, which in its descent pushes the anterior cartilaginous plate forward, and thus produces the well-marked outline of the nose in later childhood and adolescence, and which in infancy is so ill-defined. At the same time with the progress of the formation of the bony portion of the septum a union takes place between the two upper and the two lower turbinated bones respectively, and consequently we have, by the time the individual has reached adolescence, two turbinated bones instead of four, as in infancy, although there may be a rudimentary projection high up in the nasal chambers which corresponds to the rudimentary fifth turbinated bone of infancy.

Together with the growth of the septum and the union of the turbinated bones, the other bones of the skull and face enlarge, and it is easy to see that, as they are joined each to the other in so intricate a fashion that any lack of growth or interference with development of one bone must necessarily exert a distorting influence upon the others. It is thus that want of development of the bones forming the nasal cavities will cause a want of expansion of the dental arch, preventing space for the incisors, causing the jaw to assume a plowshare shape and the teeth often to overlap. Such want of development of the dental plates of the superior maxillary bones is always observed when nasal obstruction has been present in infancy. But it is not only the development of the face which is interfered with by obstructive nasal disease: the child is deprived not only of its nourishment, but, equally important, of its means of sustenance—namely, sufficient oxygen in the act of respiration. This deficiency of oxygen is an indirect result of nasal obstruction. It might be supposed that the child, although a mouth breather, would be able to take in a sufficient supply

of oxygen for all demands of the system ; but this is not so. The nose is the true organ of respiration, because it is supplied with the necessary apparatus for warming, filtering, and moistening the air before it enters the larynx, trachea, and lungs. When, therefore, the nose being obstructed, the child breathes through the mouth, the cold, dusty, and dry air impinges on the membrane of the larynx, causing inflammation and oftentimes a hacking cough. When the air reaches the smaller bronchioles the irritation causes spasmodic contraction of the smaller bronchi and air-vesicles of the lungs, so that only a portion of the lung tissue is inflated, and comparatively little oxygen is supplied to the system. This is especially noticeable in the apices of the lungs, where the bronchioles become very small and attenuated, and it is there we look for disease of the lungs in its first stages.

But long before the lungs become diseased by the inadequate preparation of the inspired air, due to nasal obstruction, the more proximate portions of the respiratory tract exhibit disturbance. If we review the diseases of the upper respiratory tract in infancy and childhood and endeavor to trace the etiology of each one of them, we shall be compelled to ascribe the ultimate cause of each to a greater or less degree of nasal obstruction or complete stenosis. By stenosis we mean complete occlusion of the nares to both inspiration and expiration, while by obstruction is meant a narrowing of these channels, one or both, which does allow a small current of air to pass. Complete stenosis is, however, but rarely met with in infancy and childhood, and is then caused either by neoplasms filling the nasal or post-nasal chambers, or by a congenital malformation of the nasal bones, most frequently observed as obliteration of the posterior nares by a thin slate of bone projecting across their posterior orifices. Partial stenosis or obstruction of the nasal chambers is, on the other hand, quite frequently met with in infancy and childhood, and is due to a variety of causes. First, and most frequently observed, is the obstruction caused by temporary, and, later, permanent swelling of the tissues covering the lower turbinated bones. This tumefaction of tissue may be caused by specific infection from the mother during delivery, or by exposure of the child to extreme changes of temperature, producing what is commonly called a cold in the head, or the "snuffles." In addition to the swelling a thickening of the normal watery secretion of the organ results from the congestion, and, by its retention in the

form of a thick tenacious flake, adds considerably to the obstruction. It must also be remembered that the tissue underlying the mucous membrane covering the turbinates is composed of a network of blood-vessels which become distended and enormously enlarged by the stimulus of an inflammatory process in the immediate neighborhood. If this inflammatory process is not speedily checked and the membrane and secretions restored to their normal state, we soon have a chronic catarrhal condition and, in consequence, more or less permanent obstruction to respiration. A less frequent cause of nasal obstruction in children is deviation of the nasal septum, which may be due to traumatism, falls or blows upon the nose, or it may be caused by the pressure of a hypertrophy of the lower turbinated body pushing the cartilage toward the opposite nasal chamber. Still another cause of impaired nasal respiration is the introduction of foreign bodies into the nose. They are usually introduced by the child itself, unknown to the parents, and give rise to symptoms of cold in the head, with copious mucopurulent discharge, which may be tinged with blood. Later the symptoms are those of hypertrophic catarrh with the addition of an offensive discharge. The ordinary mucoid polypi, which produce nasal obstruction, are seldom, if ever, met with in infancy, but are not uncommon in later childhood, and by their increasing pressure during their growth produce in time noticeable deformity by a flattening and spreading of the upper portion of the back of the nose.

Mouth breathing is injurious because the inspired air is not cleansed, moistened, or warmed as it is in normal nasal breathing, and the result is irritation of the mucous membrane of the pharynx, larynx, trachea, and bronchi, which is readily lighted up into acute inflammation by cold or other systemic disturbance. Mouth breathing kept up for a long period of time, results in chronic inflammation of the mucous membrane of the respiratory tract, favoring in children the formation of laryngeal neoplasms. The tonsils, both faucial and pharyngeal, suffer from the same cause, and acute inflammation and hypertrophy of the tonsils result. More serious yet is the fact that the concomitant inflammation of the upper air passages in the exanthematous diseases are enormously aggravated by the nasal obstruction, while the irritation of the bronchioles by the dry and dust-laden air prevents its entrance into the lungs in sufficient quantities for the requirements

of the system, and thus not only does the whole economy suffer, but the foundation of lung disease is often thus laid in early childhood.

On the other hand, it not infrequently happens in scrofulous children that a specific or non-specific acute rhinitis, instead of resulting in permanent hypertrophy of the turbinated tissues, is followed by an atrophy of not only the mucous membrane, but also of the turbinated bones, and the serous as well as mucous glands imbedded in the membrane. Such a condition interferes in the same degree with normal respiration, and produces pernicious effects upon the whole respiratory tract and the system at large, as does nasal obstruction. The nasal chambers become too large from the shrinking of the tissues, so that the air-current can not be properly warmed in its passage, and, the glands becoming atrophied, the air can not be properly moistened and filtered, so that we have the same conditions as in mouth breathing. But to all this must be added the formation of large adhesive scabs in the nasal chambers which, by their bulk, cause obstruction; by their presence as foreign bodies, irritation; and by their adhesiveness denude the membrane of its epithelium, and cause hemorrhage at their expulsion; and by their putrefaction give rise to the well-known and offensive odor of ozena. The latter fact increases the danger from this kind of nasal catarrh to the system at large, because of the volatile products of putrefaction which are carried into the lungs during respiration.

ACUTE RHINITIS (CORYZA).

It is hardly necessary to describe the symptoms of this very common affection. In the beginning there is dilatation of the blood-vessels of the mucous membrane, followed by swelling of the turbinated bodies and a discharge of mucus and serum. Later the discharge becomes thicker, mucopurulent, and tends to clog the nasal passage. The general treatment in the early stage should be directed to equalizing the circulation by cardiac and nerve sedatives, laxatives, etc. Atropia in small and frequent doses— $\frac{1}{1000}$ gr. to $\frac{1}{800}$ gr. every hour or two—has a controlling effect on the vascular dilatation in the early stage. Locally, such sedatives as the vapor of menthol and camphor, produced by placing a few grains of each in hot water and allowing the child to inhale the steam as it arises, or menthol in olive oil or liquid petroleum, gr. ij-v to the ounce, dropped into the nose are of service.

Simple ointments applied to the nostrils also help to relieve irritation. In the case of infants, if the swelling interferes with suckling, a few drops of a one or two per cent. solution of cocain may be used in the nose before nursing. In the later stage a spray or wash should be used to free the nose from the thick secretions. Such a wash should be alkaline, in order to dissolve the mucus, and of about the specific gravity of the serum of the blood, that it may be unirritating. A greater or less density favors osmosis and produces irritation. Dobell's solution—sodii bicarb. and sodii biborat., each gr. iv, acid. carbol., gr. j, and glycerin ꝑij, to the ounce of boiled water—is an excellent solution and answers the purpose. Other solutions, however, in which the carbolic acid is replaced by vegetable antiseptics, such as menthol, thymol, gaultheria, eucalyptus, etc., may be used instead. They may be applied by an atomizer, or, what answers the purpose better for young children, a small soft-rubber ball syringe.

CHRONIC RHINITIS—SIMPLE AND HYPERTROPHIC.

These are but stages of the same affection, the simple passing into the hypertrophic. Both are characterized by more or less nasal obstruction,—in the former, temporary swelling or turgescence of the turbinals, shifting from one side to the other; in the latter, permanent, due to hypertrophy of the turbinate bodies. In both, the secretions are apt to be thick and abundant. The cause may be, repeated acute attacks, or some permanent irritation within the nose, such as spurs or deviation of the septum. The indications for treatment are, removal of the secretions and the reduction of the swelling and obstruction. All projections or irregularities of the septum should be corrected, and any postnasal or faucial obstruction to nasal respiration and drainage removed. In the stage before the hypertrophy has taken place, an attempt to reduce the swelling by local applications of iodine (iodine, gr. iij, potass. iodid., gr. vj, glycerin and water each ꝑss), or menthol (gr. x to xx, liquid albolin or vaselin ꝑj) may be made. If this fails, the turbinates should be cauterized, preferably by one of the chemical caustics, chromic acid, or trichloroacetic acid. In the hypertrophic stage, cauterization by the galvanocautery or removal by the snare may be required. In both conditions alkaline antiseptic washes should be employed and the passages kept entirely clean.

PURULENT RHINITIS.

This is distinctively a disease of childhood. It may be the result of direct infection, or the sequel of one of the exanthemata. The symptoms are, a purulent or mucopurulent discharge from both nostrils, which tends to collect in scabs around the nostrils, and may become offensive. The treatment consists in cleansing washes followed by some mild astringent, such as glycerite of tannin, half a dram to the ounce of water, zinc sulphocarbolate, gr. v to the ounce of water, or alumnol, gr. v-x to the ounce ; and, internally, iron and cod-liver oil.

ATROPHIC RHINITIS (OZENA).

It is thought by some that atrophic rhinitis is a sequel of purulent rhinitis, by others it is ascribed to scrofula or inherited syphilis. It is, however, a distinct affection and never the result of the hypertrophic variety. Its chief characteristics are the formation of crusts throughout the nasal cavities, generally extremely fetid, and increased roominess of the cavities from wasting of the turbinates and membrane. The indications for treatment are cleansing, stimulation, and protection. The crusts must be thoroughly removed by spray, syringe, or cotton swab. Any of the alkaline solutions, above mentioned, may be used, but their antiseptic properties should be increased. Thymol, which is a good antiseptic and deodorizer in this condition, may be added to any of the cleansing washes, in the proportion of $\frac{1}{4}$ or $\frac{1}{2}$ of a grain to the ounce. After all the crusts have been removed, some stimulating application should be made. Nitrate of silver, gr. v to x to the fluidounce, or a solution of thymol, grs. x to the ounce, has been found efficient ; after this an oily substance, preferably vaselin, either plain or medicated, warmed and sprayed into the nose, to protect the surface from rapid drying. Such treatment must be carried out by the physician, at least three times a week at first. In the intervals the patient can use the cleansing wash, as a spray or douche, at home in the morning and evening, following it with one of the liquid petroleum preparations, with oil of eucalyptus or menthol added. The treatment must be kept up continuously until the crusts cease to form in the nose, or, at least, until the patient is

able to keep the nose free from crusts. The patient, however, must continue to use some cleansing wash for a long time afterward.

CROUPOUS OR MEMBRANOUS RHINITIS.

This is not an uncommon affection in children. It is characterized by the formation of a false membrane in the nose, which can be readily detached but rapidly re-forms. Constitutional disturbance is very slight. The principal symptom is nasal stenosis. Bacteriologic cultures have shown streptococcus, and, in some cases, the diphtheria bacillus. Clinically, the two forms are identical. The duration of the disease is from two to three weeks. The treatment consists in the removal of any loose membrane, cleansing, and the insufflation of iodoform (europhen or nosophen if preferred) or calomel. Dilute lime-water has been suggested by McBride. Iron and bichlorid of mercury or calomel in small doses should be given internally.

SYPHILITIC RHINITIS.

The coryza of syphilis is more frequently noted in infants than in adults. Any obstinate nasal catarrh in an infant should suggest the possibility of syphilis. The children usually appear emaciated, and skin eruptions will generally be found. There is swelling of the membrane and hypersecretion, which may be purulent and bloody. In tertiary syphilis, which rarely appears before the fifth year, infiltrations of gummatous material, ulcerations—especially of the septum—and necrosis of bone may be found. In syphilis of the nose the treatment is very important. In infants the stenosis often prevents sucking, necessitating feeding by the spoon. Tonics are indicated, such as syrup of the iodid of iron and cod-liver oil. In the secondary stage mercurials are all-important. They can be given by the mouth or by inunction. The nose must be kept clear by antiseptic washes. Menthol in oil (gr. v to x to f̄j) may be used to relieve the stenosis. In the tertiary stage destruction of tissue is rapid and the resulting deformity may be very great. Iodid of potassium should be given in increasing doses up to the limit of tolerance. Mercurials are of *no* use in tertiary syphilis of the nose. Seiler recommends the surgical removal of the infiltrated tissues to prevent destructive ulceration. Iodoform should be used locally.

MUCOUS POLYPI (EDEMATOUS FIBROMATA)

Do not occur in infants but are not infrequent in older children. They grow from the upper portion of the nasal cavity, but by elongation of the pedicle may occupy any portion of the nares and extend into the nasopharynx. They produce nasal stenosis and watery discharge, greater in damp weather. They do not, as a rule, cause deformity. Headache, laryngeal spasm, and asthma are often due to their presence. Polypi may be caused by disease of the accessory sinuses or by any prolonged irritation of the nasal cavities. The growths should be thoroughly removed and any underlying disease treated.

FIBROUS TUMORS.

Nasal fibromata appear as dense white or reddish tumors. They spring from the periosteum or bone. Their favorite location is at the vault of the pharynx, whence they advance into the nasal cavities, by their growth spreading the bones apart and often producing great deformity (frog-face). They should be attacked early. Electrolysis has been successful in some cases.

ADENOID VEGETATION.

There is, normally, at the vault of the pharynx a group of lymphoid glands called the pharyngeal tonsil. Hypertrophy of this tissue is known as adenoid vegetation or hypertrophy of the pharyngeal tonsil. This condition is most frequently found in childhood, as the lymphoid tissue here, as well as that in the fauces, tends to atrophy in later life. It is one of the most common causes of mouth breathing in children, and a frequent source of nasal and postnasal discharge, cough, laryngeal spasm, asthma, etc. Deafness and suppuration of the middle ear may also be due to these growths. Headache, frontal or occipital, is often complained of by children afflicted with adenoids. Adenoids may be congenital but are generally of later growth, frequently appearing after measles, scarlatina, diphtheria, or whooping-cough. An hereditary predisposition probably exists, as they are often found in several members of the same family. They are often associated with hypertrophy of the faucial tonsils and the pharyngeal fol-

licles. A diagnosis can sometimes be made by the rhinoscopic mirror, but in young children digital examination is more satisfactory. In all cases where the growth is sufficient to cause symptoms it should be removed. Local applications have no effect on these hypertrophies.

ACUTE PHARYNGITIS

Is usually caused by exposure to cold or dampness, especially in those already debilitated by hereditary influences or by living in a vitiated atmosphere. The attack is accompanied by fever, headache, pain in the throat, coated tongue, and constipation. Examination of the fauces may show a general redness or only streaks of congestion on the lateral walls of the pharynx and the half-arches. Hot foot-baths, aconite in small and frequent doses, laxatives, etc., constitute the general treatment. Locally, mild astringents (glycerite of tannin, diluted) or a single application of silver nitrate (sixty grains to the ounce) followed by mild astringent gargles are commonly employed. Wet compresses to the neck are useful and give comfort.

RHEUMATIC PHARYNGITIS

Is characterized by but slight congestion of the membrane, but a disproportionately severe pain in deglutition. It usually occurs in rheumatic subjects; is not frequent in childhood. Antirheumatic remedies should be given. Heat to the neck and rubbing with stimulating liniments gives relief.

RETROPHARYNGEAL ABSCESS.

This is an inflammation situated beneath the mucous membrane of the pharynx and is comparatively frequent in children. It is usually idiopathic, but may result from tonsillitis, caries of the vertebræ, injuries to the pharynx, and, it is said, middle-ear suppurations. The chief symptoms are pain, stiffness of the neck, dysphagia, and dyspnea. The abscess forms a tumor which projects into the pharynx and may be mistaken for tonsillitis. The pus may burrow downward into the neck; it frequently points in the neck as well as in the pharynx. As soon as fluctuation can be detected the abscess should

be opened. Care must be taken to avoid the internal carotid artery by keeping as near the median line as possible. The incision should be small at first, and the child's head thrown forward to prevent the pus from running into the larynx. Subsequently, tonics, syrup of iodid of iron, hypophosphites, cod-liver oil, etc., should be given.

ACUTE TONSILLITIS.

Three forms are recognized: The superficial, which does not differ from pharyngitis; the lacunar, or follicular; and peritonsillitis, or quinsy.

ACUTE LACUNAR TONSILLITIS

Is an inflammation of the crypts of the tonsil, attended by an exudation into the crypts and extending onto the surface of the tonsil. The disease is due to bacterial (streptococcus) infection. The exciting cause is usually cold, influenza, etc. It begins with a chill, usually followed by high fever, general muscular pains, and sore throat, with swelling of the lymphatics at the angle of the jaw. A white exudation fills the crypts and extends to the membrane around their mouths and may completely cover the tonsil. The exudate rarely extends beyond the tonsils, which are swollen. The diagnosis is not always clear between this affection and diphtheria. The treatment is both local and constitutional. An attempt at disinfection of the tonsils and crypts should be made. For this purpose peroxid of hydrogen may be used by spray or on cotton, and, if possible, carried into the crypts. Afterward a diluted solution (one-third strength) can be used as a gargle or spray. In mild cases a gargle of potassium chlorate and an astringent (Potass. chlor., $\mathfrak{z}\text{ij}$, Rhus. glab., $\mathfrak{z}\text{iss}$, add pint of hot water) is of service. Internally salicylate of sodium or salicin, five grs. every three hours, has the effect of relieving the pains, reducing the fever, and appears to shorten the attack. Along with this, calomel, in small repeated doses, serves a useful end. The duration of an attack is from two days to a week.

QUINSY, OR PERITONSILLITIS,

May be a sequel to the lacunar variety. It is more frequent in cold and damp seasons than in the warm and dry. It does not occur in

young children. The affection is generally unilateral. It is an inflammation, mainly, of the cellular tissue around the tonsil. The tonsils are less swollen than in lacunar disease, but appear prominent because they are lifted from their bed by the swelling beneath. There is generally considerable swelling and edema of the palate and pillars, and hardness of the tissues behind the jaw, making it difficult to open the mouth. In the early stage it may be possible to abort the attack by keeping the patient quiet, acting on the bowels with saline laxatives, giving salicylate of soda internally, and applying bicarbonate of soda to the tonsils every half hour. If the case shows a tendency to go on to suppuration, hot gargles (hot water), dry heat externally, and the salicylates are probably the best treatment. As there is great difficulty in swallowing, the food should be liquid and as nourishing as possible. The abscess generally points above, but may point behind, below, or through the tonsil. It should be opened as soon as pus is suspected, especially if the symptoms are urgent. The point of election is on the soft palate outside of the line of the anterior pillar. A straight bistoury, wrapped to within half an inch of the point, is the best instrument for making the incision. If pus is not found, a probe can be passed deeper with safety. Rapid subsidence of the inflammation usually follows evacuation of the pus.

CHRONIC TONSILLITIS; HYPERTROPHY OF THE TONSILS.

Chronic enlargement of the faucial tonsils may be found in infancy and early childhood, but it is much more frequent in later childhood. When present in early life the cause is probably heredity. Later the enlargement may be due to previous attacks of acute inflammation or to bad hygienic surroundings, constitutional disease, etc. Bosworth describes two varieties of enlargement of the tonsils—the hypertrophic and the hyperplastic. In the former the glandular tissue is mainly increased and the tonsil is rough and irregular in appearance. In the latter the fibrous tissue is increased, the tonsil presenting a smooth and round appearance. Very often tonsils exhibit a combination of these conditions. Tonsils in which the crypts are chronically diseased and have become the seat of cheesy deposits may be only slightly or not at all enlarged, but are a source of irritation and are

subject to attacks of acute inflammation. Many symptoms are ascribed to hypertrophy of the tonsils, most of which are due to the obstruction to respiration, nasal and oral, caused by their presence. The chief symptoms are snoring during sleep, restlessness, thick or nasal voice, liability to take cold, deafness, and tinnitus. Internal remedies have very little effect on tonsillar hypertrophy. Tonics, etc., should be given for the general condition, which is apt to suffer in these cases. As local applications, the compound tincture of iodine, diluted; tincture of the chlorid of iron (one part to three of glycerin); glycerite of tannin, and nitrate of silver (10 to 20 grs. to the ounce) are used. Of these the iodine and the iron solutions are of the most value. They can be used in recent, soft hypertrophies. If the crypts are diseased they should be cauterized with chromic acid, fused on a probe, or the galvanocautery point carried into the crypts. In moderate degrees of hypertrophy, also, the galvanopuncture may produce shrinking and atrophy. When the tonsil is large and firm, however, excision is the only treatment to be advised.

DISORDERS OF SPEECH.

CHIEFLY THOSE DUE TO ANATOMIC DEFECTS OF THE SPEECH APPARATUS.

The importance of clear speech as a factor in mental and physical development is scarcely appreciated, and the subject fails to receive the attention it deserves. Defective speech is not always the result of defective mentality, as many seem to think, but it is quite as often the cause. The child can not speak because it is thought to be stupid, whereas the child is often dull because it can not speak.

The speech faculty develops not by intuition but by imitation, and there are two ways in which this development may be retarded: First, the child's imitative capacity may be weak, while all the other faculties are strong, and then speech, which is so largely dependent upon the imitative faculty, will necessarily develop slowly and imperfectly. Again, the child may have had poor models of speech in those having it in charge, and the result is equally unfortunate. This explains why these defects are so common among the poorer classes, where the imitative faculty is oftentimes but little developed and where the speech of the attendants is careless and slovenly.

Defective hearing is also an obstruction to the normal development of speech in children. Total deafness, either before or during the formative speech period, always results in faulty speech, because the child can not imitate what it does not accurately hear ; but, in addition to this, often those "having ears, hear not." We have those who possess no ear for speech, just as there are those who have no "ear for music." They hear the speech as they hear the music, but the ear and brain do not make the fine distinctions so necessary for its sensitive differentiation or normal development ; and so, just as the training of the ear forms an essential part in the training of the musician, and just as some ears require more training for music than others, so the training of the ear should not be overlooked in those children who are backward in the development of speech. They must be taught to correctly hear the sounds and to distinguish them, the one from the other, before they can ever learn to execute them.

Various other subjective physical conditions influence the development of speech in children. Indeed, anything which makes speech difficult or even disagreeable to the child may result in serious imperfections. Obstructions in the nostrils due to hypertrophied turbinals, irregularities of the septum, or adenoid vegetation in the vault of the pharynx, act in several ways to impede speech development. They interfere with normal respiration and with the resonance of the voice ; they set up a catarrhal condition of the vocal organs, and oftentimes press upon certain important nerve filaments, causing irregular choreic movements of the muscles controlling voice and speech.

In all cases of delayed or arrested speech development these parts should be carefully and thoroughly examined and put in the best possible condition. Nasal spurs should be removed, deflected septa straightened, and hypertrophied turbinals reduced, always bearing in mind that the slightest deviation from the normal in the upper respiratory region during the formative period may render speech difficult and disagreeable, and, therefore, impossible to the child who does not appreciate the importance of good speech sufficiently to make an effort to overcome even slight impediments.

We have known a small adenoid growth in the pharyngeal vault to cause stuttering of the severest type, and the defect of speech to cease immediately upon the removal of the growth. A long and curled epiglottis setting up a pharyngeal and laryngeal irritation may be the

cause of disordered speech, and we have had most excellent results, in at least one case, by the removal of its upper border.

Another fruitful source of defective speech is found in hypertrophied faucial tonsils, which press upon the pillars of the palate and encroach upon the oropharyngeal resonant space. We often see, also, inflammatory adhesions binding the tonsils to the pillars, and preventing that free action of the palatopharyngeal and palatoglossal muscles which is so essential to good articulation. These adhesions should be destroyed, preferably by the electric cautery, if the child be sufficiently tractable, and the tonsil should be reduced in size, either by surgical or less drastic measures.

So important an organ is the tongue that its very name has come to be regarded as a synonym for speech, and "tongue-tie" is generally supposed to be the chief cause of defective speech.

By tongue-tie we mean a short frenum interfering with the movements of the tip of the tongue. This we do find, of course, in some children, and the snipping of this frenum undoubtedly gives greater freedom to the tip; but in many cases the trouble is not in the frenum alone but in the disposition of the anterior fibers of the geniohyoglossus muscles. These fibers are too short, and they are inserted into the body of the tongue too far forward toward its tip, thus preventing some of the most important movements of this organ. And so in the majority of cases the snipping of the frenum is not enough to loosen the tongue, but an incision must be made through the mucous membrane low down in the floor of the mouth, and about one-half the width of the tongue, so that the anterior fibers of muscle are divided sufficiently far back to give the tongue its normal amount of free surface and motion. This operation is described and illustrated by P. Hudson Macuen in a recent number of the journal "International Clinics," and is one which is more frequently indicated than the somewhat simpler method of snipping the frenum. In cases of cleft palate the operation should be done in the first year, before the formative speech period begins, one of the chief indications in this operation being to retain as much as possible of the soft palate and uvula, and to restore to them their normal functional activity. Generally in these cases there is too little velum palati after the operation and too little activity in the muscles which control it, the result being an inability to close the palatopharyngeal chink (the opening from the

oro- into the nasopharynx), and the stream of sounding breath which should pass out through the mouth during speech is allowed to escape through the nostrils; hence all the consonant sounds except the nasals must necessarily be defective.

Much may be done after the cleft palate operation to remedy this condition. All adhesions between the pillars should be broken up, and systematic massage of the palate, such as stretching with the finger, etc., should be practised.

The most important and the most neglected part of the treatment of speech defectives is undoubtedly the training. This can not begin too early. The child should have the best model as an example of speech and the imitative faculty should be trained and developed. All "cute" baby talk should be discouraged, and only good forms of speech encouraged.

FALSE OR SPASMODIC CROUP.

False croup, or acute catarrhal laryngitis, is an inflammatory affection of the larynx and trachea, non-contagious in nature, and excited by an acute catarrh.

Croup is one of the commonest of the respiratory diseases of early childhood, occurring at any time, but usually in the changeable weather of autumn and spring. It is of importance chiefly because of the uncertainty of the diagnosis, as well as the distress that it occasions to the family and the anxiety felt by the physician, who, be he ever so skillful, not seldom fails to make a correct diagnosis on his first visit. We are called upon to distinguish, then, between this false croup and true croup, between false croup and laryngeal diphtheria, and between false croup and laryngismus stridulus. False croup is a common malady and so is diphtheria; the others are comparatively rare. False croup occurs in isolated instances, although several members of a family may be so predisposed. It is never communicated and is non-contagious. Sporadic cases of diphtheria are not uncommon.

Symptoms.—These diseases with the symptoms common to croup come on suddenly, with a more or less well-defined prodromal stage; perhaps none at all. The earlier symptoms, before the sudden attack, are usually a slight coryza, hoarseness, and cough, with redness of the fauces and feverishness or slight fever. True croup is a rare disease,

and there is much doubt as to whether it is or is not simply a form of diphtheria. Jacobi does not speak of membranous croup at all, but classifies pseudomembranous croup and laryngitis together. There are points of difference clinically between these two diseases, but not enough to make us certain—or rarely. There is much evidence to show—and this adduced by competent clinical observers, supported in their views by excellent pathologists—that instances of false membrane in the larynx may be anatomically the same, but not a true diphtheria (presenting the Klebs-Loeffler bacillus), or may be caused by some other agency. False croup comes on suddenly or may be preceded some hours or a day or two by catarrhal symptoms and slight fever. Sometimes the larynx and trachea are involved; there is cough, but without stridor or spasm. The attack usually arises in the night, with almost no warning, except, perhaps, the cough, which changes and becomes short, deep-toned, and barking, with a peculiar resonant quality readily recognizable; the inspirations have a whistling, crowing sound; the little one exhibits surprise or terror, sits up in bed, clutches at nearby objects, especially its mother, and seems to experience some relief in holding on to objects, the way asthmatics do, which enables the ribs to become more vertical, thus assisting in securing a deeper inspiration. The cough has a metallic, hard quality, associated with dyspnea, which lasts for perhaps just a moment, or a little longer, when it lessens, and the child may, in half an hour or so, have entirely recovered and quieted down to sleep. The attack is not likely to be repeated more than once or twice at most; but several times during the night the short, barking cough may recur. Next morning the child is apparently well, with the exception of the cough, which usually remains. The attack may return on several successive nights, but this is rare. Recurrences are more likely to be due to laryngismus stridulus or neuroses, and occur chiefly in rachitic children. The temperature may be little above normal, or about 101° or 102° ; some observers report a much higher temperature.

Diagnosis.—In both false croup and true croup (membranous croup) the onset is sudden and generally accompanied by fright and dyspnea, but without delirium or convulsions. In diphtheria, of whatsoever form, there is no fright, and there are liable to be convulsions and profound debility. True croup generally begins with a chill, followed by fever, rising sometimes pretty

high— 102° to 103° at the onset and up to 104° to 105° F. at the period of greatest intensity. False croup is usually preceded or accompanied by symptoms of disordered digestion, and after the attack subsides the child is as well as ever, whereas in true croup and diphtheria there is marked depression during convalescence. In false croup the child declines to take nourishment, more because of the disturbed condition of the nervous system than of any pathologic local condition in the digestive organs, and cathartics are usually indicated and produce no over-effect or depression. In diphtheria cathartics are liable to induce considerable debility. The invasion of the larynx in diphtheria is not so abrupt, and usually takes place through extension from the fauces, and the stridulous breathing, both upon inspiration and expiration, is gradually established. The larynx may be primarily involved, making the diagnosis at first more difficult; yet it is, as a rule, not so sudden as false croup. In false croup the stridor and dyspnea are more or less paroxysmal on inspiration, and are relieved by emetics and nauseants, usually disappearing on the second or third day. The hoarseness and aphonia gradually subside, more slowly than the dyspnea, and after, and perhaps by reason of, the action of emetics. Death is very rare from false croup. Young children and those who are of neurotic ancestry are more frequently attacked, and although they may be enjoying their ordinary health. In diphtheria disturbances in the voice remain and steadily increase, becoming oftentimes a persistent whisper. False croup usually attacks children beyond one year, and up to five or six, and rarely after ten years. Diphtheria attacks much the same class of cases, although it may occur in younger and is frequent in older children. The collateral symptoms common in diphtheria must be watched for—as albuminuria, lymphatic engorgement, and paralysis. A bacteriologic examination must be made in every case without delay, and should be repeated.

Treatment of Spasmodic Croup.—The treatment of croup is simple but imperative. The child should be kept in one well-ventilated room, with an equable and distinctly moist temperature. The clothing should be sufficient, lest chill should occur. The bowels should be open in almost any event, castor oil being the best remedy, although calomel or salines may be used. The food had best be fluid, as milk, guarded by alkaline water, or thin gruels or soups. For the milder varieties, ipecac should be used to the point of nausea or

sudden relaxation ; it is well to combine this with soda, the powdered ipecac being preferable, although the syrup form is satisfactory. Ipecac may be given with calomel in minute doses every fifteen minutes in a powder on the tongue, and this it is well to combine with a little soda. For a baby of a year or two, $\frac{1}{80}$ of a gr. of calomel, $\frac{1}{20}$ of a gr. of ipecac, $\frac{1}{2}$ of a gr. of soda, with a little sugar of milk, may be given dry upon the tongue every fifteen minutes. It is not wise to use more severe depressants, unless the fever runs high, when aconite, one to two drops every fifteen minutes, is of great utility, and is safe because of the ease with which its administration can be regulated. Antipyrin is useful in cases requiring nervous and arterial sedatives and when there is decided increase of mucous secretion. With the antipyrin it is well to give a few drops of brandy or some other alcoholic stimulant.

For a child two years old—

Antipyrin,	$\frac{1}{2}$ to 1 gr.
Syrup of ipecac,	2 to 4 drops
Soda bicarb.,	1 gr.
Brandy,	6 to 12 drops

may be given every half hour to one hour during the severity of the attack or during the night, and at longer intervals during the following day. Pilocarpin is recommended, but is dangerous, as it is too depressing to the heart; nevertheless it is sometimes of manifest value, especially in older children. Antimony is not to be used, except, possibly, in vigorous older children, and then with caution. There are times when opiates are distinctly useful to allay excitement or distressing cough, but are not to be repeated too frequently, one or perhaps two doses being sufficient to relieve a violent paroxysm. A piece of belladonna plaster the size of a small coin is used by some on each side of the throat. Local cleansing or spraying of the nose or throat is to be recommended in some cases. If the rhinitis should be severe or obstructive, albolene, containing menthol, grs. xx, and camphor, grs. xxv, to the ounce, is both soothing and stimulating to the nares. In the case of a nervous child the bromids may aid in securing a good night's sleep; an opiate, however, is rather better, and 5 to 15 drops of syrup of Dover's powder acts nicely. Kerley recommends, also, to an infant three months old, tartar emetic, gr. $\frac{1}{100}$; ipecac, gr. $\frac{1}{30}$; antipyrin,

gr. $\frac{1}{4}$;—every hour. In severe laryngeal spasm great relief is obtained by fumigations with calomel, vaporized on an ordinary milk warmer and alcohol lamp under a sheet tent. The Ermold lamp is better. Use ten grains in ten minutes, and let the child lie then for twenty minutes longer. This produces a copious watery secretion from the larynx.

TRUE CROUP; PSEUDOMEMBRANOUS LARYNGITIS.

True croup, or membranous croup, is essentially the laryngeal form of diphtheria, but is not proven to be always due to the Klebs-Loeffler bacillus. It deserves to be considered separately from the general heading of diphtheria because of its clinical features, which are those of a laryngitis. Diphtheria of the pharynx presents a somewhat different onset, features, and course. True croup appears suddenly, with a series of phenomena oftentimes endangering life by mechanical obstruction before the constitutional symptoms obtrude themselves at all. Absorption from the larynx is feebler and slower than from the pharynx; hence glandular enlargement and albuminuria are uncommon, nor is there the striking asthenia seen in cases of genuine toxemia from diphtheria. Postmortem, the structural degeneration in the viscera common in diphtheria is wanting. Contagion is feeble—because the discharges from the throat and nose are less or are absent—and the course is shorter.

Symptoms.—True croup differs little in its onset from false croup or catarrhal laryngitis, except that it is slower or not quite so abrupt nor so severe at first. There is the same high-pitched, ringing cough, hoarse voice, general discomfort, and quick but not weak pulse. Dyspnea increases slowly, and under excitement becomes profound, and alarms both parents and child. The temperature is seldom high—between 99° and 100° F., or a little over; the skin is pale and moist, and as obstruction progresses—steadily, as a rule, differing from false croup—the surface grows cyanotic. Breathing becomes much more difficult on the second and third days, and is accompanied by all the distressing features which follow this state—tossing, restlessness, irritability, etc. The child seizes on to objects to aid the respiratory action by muscular efforts.

The respiratory sounds become rough, without vesicular murmur. The symptoms, if unrelieved by treatment, progress from bad to



IMPROVISED CROUP TENT, MADE FROM AN UMBRELLA AND A SHEET.

The prognosis
of the disease
is very poor

Diagnosis—

Treatment.—

worse, the temperature rises to 104° or 106° , and death ensues by strangling, convulsions, or coma.

We reported a typical case in which the symptoms rapidly grew alarming, and intubation was performed by Dr. Freeman. The cough became so extreme that the junction of two ribs with the costal cartilages parted, producing hernia of the lung, which was cured by strapping. In this case the earlier bacteriologic examinations showed no Loeffler bacilli, but analysis of the material on the tube, when removed eight days after the operation, showed them to be abundant; yet at no time was there a large amount of membrane.

The **prognosis** of true croup depends on the age of the patient and the character of the epidemic. In untreated cases the mortality is ninety per cent.

Diagnosis is to be made by careful examination, which involves exploring the larynx by the finger to exclude retropharyngeal abscess and foreign bodies. The suddenness of the onset of true croup is not so great as in false croup nor in the above-mentioned states, yet it may arise most swiftly. Bronchopneumonia has a higher temperature, as a rule, and characteristic signs in the chest. The form of dyspnea is different too. The child is quieter; in croup it is restless and struggles.

Treatment.—Nauseants should never be used, but antitoxin administered at once, in a full dose—1000 to 2000 units.

Nowhere is the serum treatment so efficacious as in these cases. Inhalation of steam is a useful adjuvant; so, especially, are calomel fumigations. The tent should be applied at once and Ermold's lamp put in operation or the practical plan suggested by Holt. This is to take an ordinary chamber-pot, and place over the top of this a strip of tin; on this is placed the calomel (ten or fifteen grains), and beneath it an alcohol lamp, with the flame in contact with the metal. Soon the white vapor of mercury rises and fills the tent; and this should be kept up from ten to fifteen minutes. (Care must be exercised not to let this be knocked over by the child and cause a conflagration.) This may be repeated every hour or two, according to the needs of the case. It affords marked relief in most cases. After the calomel has been used the tent should be removed and the room aired. Sometimes vaporized mercury causes choking, if in too concentrated a form. Salivation is rare, but may occur among the attendants, who should be

warned not to put their heads under the tent. Relief is seen usually after the second or third fumigation. It should be begun as soon as the croup is diagnosed, before dyspnea becomes marked. The operations of tracheotomy and intubation to relieve the obstruction of false membrane in the larynx must not be delayed; certainly not till cyanosis sets in, which may only occur just before death. Before the use of antitoxin the mortality was thirty to forty per cent. from these operations. Now it is much less, and decreasing steadily; partly because of the enormous help afforded by antitoxin, which is peculiarly helpful to this class of cases, and partly because the operation of intubation is more promptly and skilfully performed. This usually suffices, but occasionally tracheotomy is made to supplement the intubation when that is insufficient to afford relief.*

LARYNGISMUS STRIDULUS.

Laryngismus, laryngospasm, spasm of the glottis, or rachitic asthma, is a disorder characterized by paroxysmal narrowings of the glottis accompanied by spasmodic disturbances of respiration, occurring and recurring at intervals. It is a neurosis of the larynx, which is otherwise healthy. It should not be confounded with false croup (spasmodic laryngitis), infantile asthma, nor internal convulsions, and is rather a complication—at least, frequently—of other disorders. The paroxysm is produced by a spastic contraction of the muscles which narrow the glottis, occurs always during inspiration, and results from irritation of the recurrent laryngeal nerve or of the pneumogastric. It is asserted by some authorities to be a characteristic symptom of latent tetany. Laryngismus stridulus is a disease of infantile life, usually

* So much importance has been claimed for the marvelous success of homœopathic treatment of croup that we asked Dr. J. Nicholas Mitchell, Professor of Obstetrics at the Hahnemann Medical College, to give us a full description of his methods, which he has most kindly done. We use his own words: "For hoarse, barking, dry cough, with fever, I use a mixture of *Tr. aconit napelli* (leaves), $\mathfrak{z}\text{j}$; *Tr. spongiæ*, $\mathfrak{z}\text{ij}$; using this, according to the age of the child, from $\frac{1}{2}$ to 2 drops every fifteen minutes till the cough loosens. When the cough is loose and the phlegm is interfering with respiration, with occasional spasmodic, barky cough, I mix one grain of the one-tenth trituration of *hepar sulphur.* in from 4 to 6 teaspoonfuls of water, and give one teaspoonful every fifteen to thirty minutes. *Hepar sulph. calcareum* is an impure calcium sulphid." We have tried this faithfully, and with fair result.

from the fourth to the fourteenth month, and rarely beyond the third year. The children attacked present many marks of neurosis and irritability. The disease prevails in the cold months and among those too much confined indoors.

Causes.—The causes are constitutional and local. It is pretty well established that the constitutional disorder known as rickets is at the bottom of most, if not all, the cases of laryngospasm, and two-thirds of the children affected present well-marked evidences of rickets. In rachitic infants nervous irritability is generally exaggerated; in them slight exciting causes—emotional, exposure, and catarrhal—readily produce morbid respiratory conditions. Hereditary predisposition is blamed by some, but this is scarcely more than can be explained by the neurotic constitution and impaired nutrition. Local causes are numerous, but chiefly in the line of digestive disturbances, protracted or acute. Pressure from enlarged glands and diseases of the heart and liver are now and then exciting causes, as is also confinement in a vitiated atmosphere.

Symptoms.—The laryngospasm begins suddenly at night in a child otherwise apparently healthy, who then gasps for breath and becomes rigid, throwing the head far back. The face becomes cyanotic, pale, or dusky; a cold sweat breaks out, and, after a brief interval, a few whistling or crowing inspirations are heard. The breathing again becomes “locked,” and presently, the child straining to get its breath, reproduces the whistling sounds. This, repeated two or three times, is followed by expiration, a vigorous cry, and the breathing again becomes established. The glottis may be completely closed, and the muscles of the thorax and diaphragm tense; if the closure be incomplete, attempts to in-breathe are laborious and noisy, as described. The effect of the strain is shown upon the heart’s action; if severe, consciousness may be lost, and the urine and feces voided involuntarily. The seizures vary in severity and in number; the milder ones may pass without much distress. The number of attacks varies from a few to thirty or forty in the twenty-four hours. If the spasm continues longer than a minute or two death is likely to result. The paroxysms may occur as readily in the daytime as in the night. There is no accompanying fever, unless some other disease supervenes. Dyspeptic symptoms are nearly always present. As the disorder progresses spasmodic phenomena occur, very often in other parts of the body,

the most frequent of which is the indrawing of the thumbs and the upward drawing of the great toe—"carpopedal spasm." The foot is sometimes drawn up against the shin and the hands bent upon the forearm. The course of laryngismus stridulus is irregular, the attacks occurring at intervals of varying length and severity; the course usually, however, "runs a circuit of aggravation, climax, and diminution." The duration is uncertain, and the first attack may prove fatal in a few hours or it may last, or recur, for months. The complications of laryngospasm are very numerous, involving sometimes the membranes of the brain; oftentimes, also, there arise catarrhs of the lungs, bronchial tubes, and larynx, and of the intestines.

Diagnosis.—Laryngospasm is rare in America, and so sudden and brief is the seizure, and so free from disturbance the intervals, that there should be little difficulty in recognizing the disorder. It is accompanied by no fever, change of voice, or cough; therefore there is no occasion to mistake it for croup or other organic disease of the larynx. False croup it somewhat resembles, but the clinical history is quite different.

Prognosis.—The prognosis varies, but is never good, a large proportion of cases ending fatally. This is not strange when one reflects upon the enfeebled conditions of those in whom it occurs.

Treatment.—The important element of treatment is constitutional repair, and this is treated of at length under rickets and developmental methods. The digestion in most sufferers is conspicuously bad, and needs careful regulation—the entire avoidance of starchy food and of substances difficult of digestion. Animal foods, strong broths, and milk are best. Of medicines, cod-liver oil and phosphorus are the sheet anchors, and next come iron, arsenic, and manganese. For the relief of the spasm a host of remedies are advised, the best of which are local or general counterirritants, in the shape of cold or heat, baths, and volatile substances applied to the nose. In extreme apnea relief is afforded by placing the child in a hot bath and dashing cold water on its face and chest, or a hot mustard foot bath with ice compresses to the head and neck. Strong currents of electricity, especially faradism, to the chest and larynx may stimulate breathing. If death be imminent, blowing into the lungs is sometimes effective, or intubation may be demanded. Tracheotomy is to be avoided. Artificial respiration after the manner of Marshall Hall is of use. The

bowels should be promptly unloaded by an enema of water or glycerin; if time allows a dose of castor oil or calomel should be given. Of depressomotor remedies musk is said to be best; next comes castor oil, the bromids, valerian, and chloral hydrate, but opium should be used with great care. The dose of musk is from a grain to two grains in the syrup of lactucarium, or it may be given in the form of the tincture of musk—from five to twenty drops. During the interval tonics should be used, and it is well to bear in mind, as Jacobi points out, that in rachitis, while the heart may be of average size, the arteries are abnormally large, thus lowering blood pressure, and the circulation in the respiratory organs is slow and sluggish, tending to produce congestion and catarrh; therefore it is advisable to add cardiac tonics, as strophanthus, digitalis, or spartein sulphate. Many cases bear well $\frac{1}{6}$ of a grain of codein in the day. General convulsions are liable to follow the attack, and for this the cautious inhalation of chloroform or a rectal injection of from four to eight grains of chloral hydrate may afford relief. (See Convulsions, Treatment of.)

ACUTE BRONCHITIS.

Bronchitis is an inflammation of the bronchial mucous membrane of the large and small tubes, due to many causes, and is rather a symptom than a disease. Capillary bronchitis, or a catarrh of the smallest tubes, is no longer used as a division of the disorder, but is an integral part of bronchopneumonia. These final ramifications can scarcely be affected without also involving the alveoli. The only practical division is into mild and severe cases of bronchitis.

Causes.—Acute bronchitis is common in children as the result of cold and exposure. It occurs most frequently late in the autumn and early in the spring, when changeable weather is prevalent. Bronchitis also accompanies a large number of infectious diseases, especially in children, in whom the bronchial mucous membrane is peculiarly susceptible to congestion, as in typhoid fever, measles, whooping-cough, influenza, diphtheria, rötheln, and, usually, scarlatina. In infants it is also a common accompaniment of dentition, where there is a lowered condition of nutrition present, as in rachitis. Here it is more likely to be the feebleness of the individuals which renders them extremely susceptible. Irritating gases or substances introduced into

the bronchi induce mechanically a bronchial catarrh; also any form of lung degeneration, notably tuberculosis. Bronchitis is also a common symptom of septicemia, and a special variety has been pointed out coexisting with putrid diarrhea. It is seen in diseases of the kidneys, where it may result from toxins or may evidence pulmonary edema. Frequently-recurring bronchitis is very likely to have its origin in enlarged bronchial glands. No one bacillus can be claimed as the specific cause of this disorder.

Pathology.—The anatomic changes in acute bronchitis are practically the same, from whatsoever cause. Owing to the swelling of the mucous membrane, the lumen of the trachea and bronchi become smaller. There is temporary functional arrest of the action of the mucous glands, with subsequent increase in their activity.

As the congestion diminishes desquamation of the ciliated epithelium in the mucosa and swelling of the submucosa, with infiltration of the leukocytes, take place. The pathologic changes, as a rule, are confined to the mucous membrane, producing no change beneath it, unless the case is protracted, when there may be slight thickening of the walls. Should the smaller bronchi be affected occlusion may result, with collapse of the alveoli supplied by them; hence supervenes a general collapse, more particularly in infants, where the catarrhal products there heaped together produce unusual troubles—emphysema or alveolar catarrh. During the earlier stages, when the cough is spoken of as “tight,” the epithelium after the primary congestion accumulates along with little moisture, and as these cells are not then reproduced, they do not readily come away in the sputum.

The sputum consists of cellular debris, of mucous plugs secreted from the glands in the bronchial walls, and of mucus which has been formed in the epithelial cells themselves, together with pus cocci.

Should there be intense congestion, the mucus may also become blood-streaked, and on examination of the submucosa ecchymotic spots will be found. The changes which sometimes take place in the character of the secretion have led to the subclassification into bronchorrhea serosa, bronchitis fœtida, etc.

The lymphatic glands at the root of the tongue become enlarged, particularly in infants and young children—a point of great importance. These are liable to remain more or less engorged and to become the starting-point of subsequent attacks, and while not originally

tuberculous, may readily become so. This is a large factor in the production of anemia, in delaying convalescence, and in provoking malnutrition.

In chronic bronchitis the acute form of the disease fails to undergo resolution; the cellular infiltration of the fibrous coat continues, producing a thickening of the whole bronchus with diminution of its caliber, leading first to hypertrophy and then to atrophy and impaired elasticity and favoring the formation of dilatations. If this process continues the infiltration leads to the formation of fibrous tissue, resulting in interstitial pneumonia, and the contraction of this produces (especially when formed in the interlobular septa) a dilatation of the tubes, known as bronchiectasis. Chronic bronchitis is always accompanied by more or less atelectasis and emphysema.

Symptoms.—The first symptom of a mild bronchitis in very young children is usually a coryza, slight catarrh of the upper respiratory passages, some elevation of temperature— 100° to 101° F.—and a hard, dry cough of more or less severity, lessened appetite, some evidence of discomfort, referred to the chest or stomach, slightly hurried respiration, and quickened pulse. The pulmonary resonance is normal; a few sibilant or sonorous râles may be heard near the mid-line, posteriorly, the state lasting from two to three days. When the mucus becomes more moist, and as recovery advances, there is looser and less constant cough, along with increased expectoration and greater liveliness.

Expectoration is not possible in infants and is only an acquired capacity of later years—at six or seven; the mucus is therefore swallowed, producing more or less intestinal discomfort and tending to excite reflex cough.

If the temperature should run above 101° F., and especially if it remain high beyond the third or fourth day, a critical search should be made for evidences of bronchopneumonia. Before this can be determined we may have a group of symptoms which are common to severer bronchitis and to the pneumonic extension—a dilatation of the alæ nasi on inspiration, or other evidences of dyspnea, with a sinking in of the tissues above the sternum or of the soft parts along the insertion of the diaphragm, and accompanied by increased rapidity of respiration and pulse. The temperature may become high or remain low. Temperature change in bronchitis is to be attributed to the

cause rather than to the disease; there is no typical curve. If all this again mitigates in a day or two, apprehension lessens as to deeper extension of the catarrh, even though there be pronounced nervous phenomena with grunting expiration and evidence of much pain on coughing. Anxiety is caused by a protraction of these symptoms; particularly if there be more or less temperature elevation, with an increased proportion of respiration over pulse-rate, a tendency for the infant or child to become apathetic, along with a cool, moist skin, we may anticipate finding evidences of bronchopneumonia upon exploration of the chest.

Prognosis.—The prognosis depends upon the cause which has produced the disease, and must be estimated in the light of the previous malady. The duration of a mild bronchitis is usually three or four days, and even when quite severe rarely lasts more than a week or a week and a half. That which follows pertussis may last indefinitely; so in measles. The situation of the affection in the smaller or larger tubes is not of uniform significance in estimating duration. If the bronchial glands are enlarged we may fear considerable protraction and ready recurrence of bronchitis, and a danger of tubercular infection. If the child be vigorous and appear well the catarrh is easily thrown off and the disease ends promptly; if of lowered vitality the disease lingers, from whatsoever antecedent cause. Constitutional defects, as rickets, are most unfavorable; so, indeed, is organic damage, such as cardiac valvular disease.

Bronchiectasis, or acute dilatation of the bronchi, may occur, due to inflammatory softening of the walls of the lesser tubes. Aero-emphysema is commonly associated with these dilated tubules. Hence will be found hyperresonant areas, with prolonged expiratory murmur.

Collapse of the lung may take place occasionally during the course of a bronchial catarrh. The symptoms of collapse are not always definite, but are usually a distressful cyanosis, excited struggles for breath, and possibly convulsions and marked asphyxia.

The physical signs are not so clear. Percussion sounds are rendered obscure by closely associated areas of emphysema (dilatations), with collapsed bronchi and pneumonic patches. Respiratory murmur over the collapsed area is weak.

Diagnosis.—The diagnosis of bronchitis is obvious enough; a cough with bronchial secretion is not to be mistaken; râles may or

may not at first be heard and may be few or many on one or both sides of the chest; later, when these become moist and more numerous, they are more readily distinguished. The important points in diagnosis are to estimate the character and significance of the bronchial catarrh in the light of its antecedent factors and the vigor of the child. In a simple bronchitis, of howsoever great severity, there is no modification of the percussion note, and in cases of circumscribed pneumonic consolidation there may be very little. The presence of broncophony and bronchial breathing will aid us here.

Treatment.—The first thing in treating bronchitis is to regulate surrounding conditions or to enforce them more vigorously where the disorder complicates an already existing disease. A laxative is one of the first and most useful remedies, and the best is a dose of castor oil or a simple saline, such as magnesia. The old-fashioned combination of small doses of Dover's powder and calomel at frequent intervals gives prompt relief. Counterirritation to the chest is also most useful when applied early.

Next in importance to the salubrity of the environment may be ranked attention to the digestive organs. Food should be of the simplest, and taken slowly; and milk and eggs rather than meat, with possible aids to digestion and antifermentatives. Calomel is useful as a laxative, to deplete the liver and thus avert pulmonary congestion, to stimulate secretions of the various glands, and as a diuretic; it is best given in small doses and frequently. Derivatives applied to the chest are of recognized value, and all means which aid dilatation of the cutaneous capillaries. Poultices of hot flaxseed or cornmeal, used posteriorly for half an hour at intervals of three or four hours for one or two days, removed carefully and followed by a stimulating application both back and front, the whole chest being covered in with cotton wool, is an efficacious treatment in our hands. One of the most important effects of this procedure is to tranquillize the child, who falls asleep soon after the first poultice and during the intervals. The constant use of the cotton jacket covered with oiled silk is preferred by some. The counterirritant may be turpentine, $\frac{5}{j}$ to the ounce of sweet oil, or almond oil or camphorated oil or soap liniment. Oil of amber is excellent, or croton oil diluted. This should be rubbed in with the hand thoroughly, in a warm corner of the room, and followed by a special skin protection (as the cotton wool). It is some-

times well to accompany this with a hot foot bath, which is always a wholesome febrifuge and derivative. As both an expectorant and a diaphoretic, hot drinks serve a useful turn when they can be administered, in which may be put a few drops of spirits (whisky) or sweet spirits of niter or both. An emetic is exceedingly efficacious at the start, especially ipecac or hot water and salt (apomorphia is too depressing for children). A moistening of the air, as under a croup tent, is another valuable and prompt remedy often needed. Expectorants are useful solely for the purpose of stimulating bronchial secretion when scanty, and when the râles are few and dry, the cough frequent and harassing. Once secretion is thoroughly established their function ends. The chlorid of ammonium is of some use in keeping up this action, especially if combined with a grain or two of potassium iodid, and may be continued with some advantage to assist an accompanying intestinal catarrh. The coal-tar antipyretics are also useful expectorants, antipyrin coming first, then phenacetin and the others, and are best accompanied by some alcoholic preparation, as wine of pepsin, elixir calisaya, port or sherry wine; of course, in very small doses. It is wise not to try to check the cough by narcotics, as it is feared this procedure may precipitate pneumonia. For nervous symptoms, opium used cautiously for a day may serve a good turn, especially Dover's powder. Alcohol is a useful remedy, tranquillizing and relaxing the cutaneous blood-vessels. Where the glandular enlargements are considerable creosote is recommended, and also, internally, preparations of iodine, especially the syrup of hydriodic acid. If the cough continues an excellent way to expedite its going at the end of a week or two is to administer a full dose of castor oil, which alone may be sufficient; or if this fails full doses of quinin for a day or two will often bring about the desired result.

CHRONIC BRONCHITIS.

Chronic bronchitis, or subacute bronchial catarrh, is occasionally encountered where the child has either had repeated exposure and recurrent attacks of bronchitis or is so weakened in health as to be unable to acquire full restoration after a fresh attack. Sometimes it is not possible to account satisfactorily for the condition, though there will usually be a history of many rapidly following acute attacks or an

unusual susceptibility. This last may be inherent or the result of specific disease, as pertussis, measles, or diphtheria. The rachitic child is peculiarly susceptible to bronchitis and irritative cough; also members of tubercular families or the so-called scrofulous children.

The **symptoms** are troublesome cough, expectoration, moist or dry râles, generally in both lungs (if fine râles they are in the bases usually), absence of fever, and unimpaired resonance or, possibly, emphysema.

Diagnosis.—From fibroid phthisis the distinguishing points are absence of dulness and of such râles as point to dilatation of bronchi or consolidation, normal vocal fremitus and resonance, and one or more of the occasional outpourings of offensive-smelling mucopus which accompanies fibrophthisis.

Additional Suggestions as to Treatment of Bronchitis and its Complications.—Certain authorities recommend bicarbonate of soda, ten to fifty grains a day, with one grain ipecac; ten to fifteen grains ammonium chlorid a day, or two to five grains every three hours; apomorphia, in older children, $\frac{1}{150}$ grain every two or three hours, or potassium iodid to loosen a "tight cough"; terpin hydrate, in doses of $\frac{1}{4}$ to $\frac{1}{2}$ grain, frequently repeated, especially in the chronic form; also terebene, ten- to twenty-drop doses. The complication of asthma is benefited by iodid of potassium, increasing doses to toxic effects, then slowly decrease and stop. Accumulated mucus may demand an emetic; if danger of suffocation or great effusion, frequent changes of position. If cyanosis arise and the voice is not heard, it is imperative to make the child cry—smacking with a wet cloth, swinging about, faradic current, etc. If cough is irritating, small doses of opium, codein, or extract hyoscyamus—the opiate, especially at night. Chlorid of ammonium evaporated on a hot stove, turpentine atomized, or compound syrup of white pine are useful expectorants; compressed air and oxygen are of great help in dyspnea and during tardy convalescence.

Pharyngeal catarrh is a frequent cause of aggravated cough and demands local treatment, such as frequent washings with nitrate of silver (weak solution), alkaline antiseptic spray or extract of hamamelis, or applications of iodine, potassium iodid, and glycerin solutions, tannic acid in glycerin, or menthol camphorate in liquid petrolatum.

Fibrinous Bronchitis.—A false membrane may be formed, resembling diphtheria; use inhalations of steam, turpentine, benzoin,

lime-water, chlorid of ammonium, fumigations of calomel, ten to fifteen grains every few hours under a tent. Internally, give potassium iodid, large doses.

Asthma is frequently due to peribronchitis and emphysema; hence potassium iodid is indicated, with an opiate at night. Cleansing the nares is useful, and it is well to always remove all obstruction or hypertrophies. For the asthmatic attacks: tincture of lobelia, two to three drops; fluid extract quebracho or grindelia robusta, $\frac{1}{2}$ or one dram each, will often relieve dyspnea (Jacobi). Fluid extract euphorbia pilulifera, increasing doses, is a very useful antispasmodic. Night cough and night irritation are relieved by bedtime doses of bicarbonate of soda or carbonate of magnesia and codein and hyoscyamus or laxatives of castor oil or cascara.

Emphysema in children presents an easier diagnosis than in adults; the lung tissues are more elastic; cellular activity of the alveoli is more active and more easily influenced by nutrition and by remedies, respiratory exercises, and blood repair; to induce sneezing is of value. Nebulized expectorants and resinous principles are useful.

BRONCHIAL ASTHMA.

Bronchial or spasmodic asthma is a form of paroxysmal dyspnea, along with wheezing respiration, occurring in sharp attacks; but perfect health is enjoyed between the intervals. It occurs quite frequently in childhood, and rather more in the upper than in the lower walks of life. Most writers agree that it is a neurosis resulting from disturbed innervation of the pneumogastric or its ramifications or the vasomotor nerves. Hay-fever is an affection which closely resembles bronchial asthma and alternates with it. The affection seems to run in certain families, especially those of irritable and unstable nervous equilibrium, and exciting causes are only operative where there is a predisposition to the disease. Oftentimes no definite exciting cause can be demonstrated. The respiratory center in the medulla is thought by some to be irritated by vitiated blood of a wide variety of sepsis. Enlarged bronchial glands pressing upon the pneumogastric nerve or upon the bronchioles account for many cases. Bronchitis alone or in an emphysematous lung is frequently recognized as an exciting cause. Various mechanical irritants to the upper respiratory mucous mem-

brane, as the air of certain localities, dust of various sorts, palpable or impalpable powders, odors, as of flowers or of hay, the effluvia of animals or decomposing substances, and an endless variety of causes of most differing kinds are competent to excite an attack. Changes in the barometric pressure and disturbances of the stomach are the most efficient instrumental causes. Asthma and eczema sometimes coexist or alternate with each other.

The **pathology** of bronchial asthma is not known ; there are many theories, such as that it may be due to spasm of the bronchial muscles ; also, that the attack is due to the swelling of the bronchial mucous membrane, to a catarrh of the bronchioles, etc.

Symptoms.—Asthmatic attacks usually occur without warning. In some there are slight premonitions, rather vague ; in others there is itching of the skin, copious urination, or a slight nasal catarrh. The paroxysm generally comes on at night, the patient becoming awakened by distressing dyspnea, steadily increasing, with characteristic wheezing and oppression or pain of the chest. He must sit up, and is more comfortable holding on to objects, with shoulders elevated and head thrown back, to give the muscles of respiration and their allies the utmost play. The face becomes anxious, pallid, and, later, cyanotic ; the skin moist, and respiration loud and wheezing. The respirations are rarely much increased in number ; speech is difficult ; the ribs expand but little ; inspiration is jerky and expiration prolonged and laborious. The number of respirations is not much increased, and there is little or no thoracic expansion. The pulse is rapid and thready, there is no elevation of temperature, but in a prolonged attack it becomes subnormal, the extremities growing cold and clammy, the face livid. After the paroxysm there is usually much exhaustion, and the patient sleeps. On awakening there is little left except muscular soreness, and the return to usual health is prompt. Percussion during the paroxysm shows hyperresonance, and there is heard some diminution or prolongation of the vesicular murmur. Toward the close moist râles are distinguished, and piping, wheezing, and cooing sounds.

The **prognosis** in young subjects is good ; especially is improvement marked in some cases about the time of puberty, and if there be no serious complication or grave underlying disorder.

The **diagnosis** should not be difficult, but bronchial asthma may be confused with obstruction of the upper air-passages, foreign bodies,

croup, edema of the glottis, suffocative urticaria, new growths in the larynx, tracheal stenosis, pulmonary edema, pleuritic effusion, uremia, and cardiac disease. Bearing in mind the absence of elevation of temperature will enable one to distinguish asthma from the inflammatory affections. Emphysema and asthma frequently coexist, and the one may superinduce the other. Cardiac asthma is rare in children.

Treatment.—Most sufferers from bronchial asthma are below par in health in some direction, and these need special reparative treatment as well as specific medication. Some sufferers from asthma, however, are of magnificent physique, as evidenced by two personal friends of one of us, who have made themselves famous on two continents as monumental specimens of vigor. The treatment divides itself into the special medication directed to the prevention of the paroxysm and the use of remedies to relieve the suffocative attacks. It may as well be frankly stated that there has been very scanty success in the treatment of this disorder. This may be because physicians, as a rule, do not give it sufficient attention, and the most conspicuous instances of relief are occasionally seen at the hands of certain quacks or of physicians who keep secret the means and manner of their work. It is quite impossible to enumerate here the wearisome array of remedies and measures offered for the relief of asthma, especially if we include, also, disturbances from that disease known as hay-fever, rose-cold, and the like. Wherever there can be discovered exciting causes, the most obvious of which are nasopharyngeal obstructions, these must be removed, and thoroughly; hypertrophied turbinated bodies, adenoid growths, lingual or pharyngeal tonsils, nasal polypi, and catarrh of any part of the respiratory tract, demand attention. Climatic and domestic conditions must be revised; diet should be modified and, as a rule, lessened. Hygiene; out-of-door life; cold sponging; change of climate here and there, in the choice of which there is almost no safe rule; the use of certain tonics (cod-liver oil and iron are lauded) and of various alteratives; long courses of arsenic and of various sorts of alkalies (because uricacidemia is so often the chief fault)—produce a fair proportion of cures. The best single remedy is potassium iodid, and perhaps the most satisfactory plan of treatment, certainly in our experience, is the following: Put the sufferer to bed, or limit his activities as much as possible; feed upon an absolute diet of skimmed milk, with peptonizing measures if necessary; keep the

bowels open, preferably with salines (mixed ones are better than single) and administer potassium iodid in rising doses, one drop of a saturated solution extra each day, until full toxic symptoms are produced ; then slowly reduce, in the same order to the point of tolerance, and keep at that for about a month ; then slowly lessen until none is taken. In so complicated a malady as bronchial asthma, with its peculiar features, the vigorous health so often seen, which is suddenly and overwhelmingly paralyzed by intensity of distress, argues either for a profound neurosis or for diathetic conditions as yet not understood, but for which is it reasonable to hope and expect to discover a controlling remedy soon or late. The relief of the paroxysm is also not to be predicted ; some simple thing may accomplish this perfectly or powerful medicines may be demanded. Morphin, administered under the skin, especially along with a little atropin, promptly relieves most adult cases, and may be given, with the utmost caution, to children ; but its use is, of course, not to be encouraged. The inhalation of chloroform offers prompt and temporary relief. Chloral hydrate, given by the mouth or rectum, is better and more lasting. Nitrite of amyl or iodid of ethyl inhaled, or nitroglycerin given by the mouth, pilocarpin under the skin, the use of many pungent smokes, as of stramonium, relieve some cases. Perhaps the best-known remedy is the fumes of niter paper ; and safe enough it is, especially if administered under a tent. There are various combinations put up in the form of cigarettes, the materials of which are modestly concealed ; or powdery substances to be burned, sold in the shops as infallible remedies, are pretty useful. Tobacco is advocated, but is depressing to children. The nitrites are praised, but are disappointing ; so is grindelia and quebracho. The best, perhaps, is the fluid extract of euphorbia pillulifera in increasing doses.

PULMONARY EMPHYSEMA.

Pulmonary emphysema is a condition of the lung in which air to an abnormal extent accumulates within it. The interstitial form, known also as the extravascular, gives rise to no untoward symptoms as a rule. The vesicular variety, also known as alveolar emphysema, is of much more importance if the process be extensive, but is extremely rare in children under ten years of age. This is again divided into

two varieties: (1) Compensatory emphysema, wherein the vesicles of one portion of the lung are abnormally distended in consequence of the disablement, or insufficient expansion of some other part of that organ. This form of emphysema is occasionally seen in young children, the causes being predisposition, enfeeblement, lowered nutrition, and locally mechanical obstruction, which produces increased vesicular pressure. Excessive coughing in pertussis produces violent respiratory efforts, inducing air-bubbles to escape into the interlobular tissue, as well as to hyperdistention of the alveoli. In most cases, however, complicating acute bronchitis and pertussis, the emphysema is but temporary, and small structural change is left. (2) Substantive emphysema is a chronic and scarcely curable malady, characterized by abnormal distention of the air-vesicles along with structural changes in their walls. It is almost never seen in children under ten years of age, but is more frequently encountered during adolescence. It would seem to be due in part to hereditary tendency. Bronchial catarrh inducing swollen mucous membranes, and much pressure in the bronchioles of sticky mucous, induces topical collapse, and the neighboring lobules endeavor to do double work and become hyperdistended.

Again, during enforced respiratory efforts with a closed glottis, as in violent paroxysmal coughing, the air is driven back and becomes lodged in the less resisting areas, as the apices and anterior borders of the lungs. In any event there needs to be some inherent feebleness or degenerative change to account for the anatomic alteration. This may be a chronic inflammation, a pneumonitis attended with the production of fibrinous tissue, along with an atrophy of the normal parenchyma. The postmortem changes are much the same as in the emphysema of adults. There is usually some hypertrophy of the right ventricle of the heart and perhaps secondary dilatation. The symptoms of emphysema in young children are oftentimes negative, and when present, are like, but milder than, those in adults. Dyspnea is one of the most common symptoms, at first only noticed upon exertion, and later more severe upon slight disturbances of either the nose or the nasopharynx, the bronchi or digestive organs. Cough is readily excited, especially in winter, and asthma often arises. Children rarely exhibit the barrel-shaped chest of emphysema, but they do sometimes show an increased depth anteroposteriorly, and rigidity. Percussion gives

few signs of value ; the thoracic walls of children being so elastic and the organs small, transmission of resonance is favored from other parts. Auscultation reveals a low-pitched respiratory murmur with prolonged expiration ; the second sound of the heart may be accentuated. Recovery may be looked for if the disturbance has not continued too long. Emphysema itself does not imperil life except as a complicating factor in other diseases.

Treatment.—The treatment is mainly prophylactic; exciting causes should be guarded against and receive prolonged treatment. Attention to the skin by cool bathings, thorough rubbing, and woolen underwear must be faithfully and continuously given. The digestive organs must be guarded from disturbance with unusual faithfulness. Many tonics are of value, of which iron has a suitable place, especially in the form of Basham's mixture. *Nux vomica* is of some efficacy, and arsenic more so. In the chronic bronchitis which so frequently coexists, iodid of potassium is of special value. Next come the resinous preparations, then terebene and guaiacol. Cod-liver oil is the reliable tonic.

ACUTE BRONCHOPNEUMONIA.

Bronchopneumonia—also called **catarrhal pneumonia**, **lobular pneumonia**, **capillary bronchitis**—is an inflammatory disease of the terminal bronchioles and pulmonary air-vesicles, affecting the lobules in scattered areas. The disorder is in the main a catarrhal inflammation of the bronchioles and air-sacs, although the peribronchial and interventricular tissues are also involved. The disease often proves fatal in a few days, or it may linger in a chronic form, leading to secondary changes or inducing a tendency to tuberculous infection.

Causes.—The primary cause is usually bronchitis, either the simple catarrhal form or that which accompanies or follows infectious processes, especially measles, whooping-cough, diphtheria, or tuberculosis. Bronchopneumonia is in nearly all cases a secondary disease ; it may arise as a primary disease, or from an untraceable cause, or as a result of irritants, mechanical or gaseous, entering through the mouth, nose, or respiratory passages. In the bronchopneumonia of diphtheria the streptococcus is the usual cause. In the new-born it may result from inhalations of the maternal secretions during birth. In most cases

the specific cause is the pneumococcus, the tubercle bacillus, or in certain instances the staphylococcus aureus and albus or streptococcus pyogenes. Secondary cases are usually due to a mixed infection. Most fatal cases occur under two years of age, especially during primary dentition. Pneumonias stand next to diarrheas as a cause of infantile mortality, and the lobular is much more common than the lobar form. Infants show a marked tendency to catarrhal processes. Depraved vitality is a powerful predisposing cause, the result of unwholesome environment and diet and improper care. Especially is this noticeable during the prevalence of epidemics of measles, diphtheria, and whooping-cough, during convalescence from which sufficient care is too rarely exercised. Season has much to do with the prevalence of this disease, it being by far the more frequent during the winter and spring, and especially if the weather be changeable from wet to dry. Steady cold is rather favorable to immunity from catarrhal pneumonia, but during damp summers it is liable to prevail.

Pathology.—The essential lesion in bronchopneumonia is an inflammation of the walls of the terminal bronchi, bronchioles, and the adjacent alveoli, with the rapid casting off of epithelial cells, one after another, along with a few leukocytes or red corpuscles accumulating within. As the process continues, there is an increase in cellular desquamation, with outpouring of mucus, filling up the tubes and air-vesicles; thus centers of consolidation are formed in different parts of the lung, at times only attacking small portions, and, again, invading large areas irregularly. Both lungs are usually attacked, sometimes so extensively as to involve a whole lobe. Bronchopneumonia develops by the regular invasion of successive portions of the lung, and resolution takes place in the same gradual manner. The mottled appearance seen on inspecting an infected lung is due to areas of red and gray hepatization in close proximity. Absorption takes place more readily of the fibrinous exudate than of the cellular elements; and hence in bronchopneumonia, where the inflammatory products are mostly cellular, they are more slowly resolved than in lobar pneumonia, in which they are mostly fibrinous. The process begins in the terminal bronchi and extends into the bronchioles and air-sacs, either by inflammation, following the epithelial lining, or mechanically, by violent inspiratory efforts induced by coughing. Thus the smaller tubes become plugged up, producing

atelectasis, even where the act of expiration forces the air out of the cell; inspiration being a weaker act, they fail to become refilled. Once the vesicles become collapsed, congestion takes place, which is also partly mechanical, inflammation results, and the temperature goes up. Parts of the lungs which are not hepatized are congested and edematous, and the air-spaces in the alveoli are encroached upon by the congested blood-vessels and epithelium.

On microscopic examination the bronchioles will be found filled with an exudate containing leukocytes and epithelial cells; occasionally, also, blood-corpuscles. The alveoli in the immediate neighborhood of the affected bronchus will be more completely filled with the exudate than the outlying ones. The capillaries in the walls of the bronchi are somewhat distended, and the general appearances of an interstitial inflammation are present.

These areas of collapse are mostly symmetric, occurring in the posterior borders of both lower lobes, and sometimes in the upper ones, and may arise during the acute stage or when the pneumonic process is more established. There are no clearly marked stages in broncho- as in lobar pneumonia, and all of them may appear in different areas of the same lung. Nearby these zones of congestion the bronchi frequently become dilated, owing to the weakened condition of the bronchial walls; yet this condition is liable to disappear entirely upon recovery. Emphysema frequently arises in the course of bronchopneumonia, usually vesicular, and more commonly in the upper lobes, but also may be widespread, and is more common after whooping-cough. There may be interstitial emphysema also, caused by the rupture of air-vesicles lifting the pleura or extending between the lobules. Bronchopneumonia may persist, the proliferative cells taking part in the formation of new connective tissue, causing persistent thickening. This occurs especially after other than first attacks. The walls of the bronchi and the peribronchitic tissue are subject to a persistent thickening and fibrinous formation, producing a chronic bronchopneumonia. The cicatricial tissue surrounding the bronchi causes an increased dilatation in the walls already weakened, and there follows sacular as well as fusiform dilatation.

The macroscopic appearances usually show a tendency to lobular limitation, these lobules being raised somewhat from the surface and exhibiting alternations of dark-red or grayish color. Sometimes

a whole lobe may be affected, and then it is very like the appearance of croupous pneumonia. Next to the consolidated lobules there is sometimes seen emphysema, the one overlying the other. On the lung being cut, the various lesions are seen most beautifully, areas of atelectasis and of peribronchitic congestion, adjoining the smaller bronchi (from some of which issue mucus or mucopus), and emphysematous patches. The air-vesicles are themselves sometimes inflamed and found filled with red blood-cells. In the very acute cases extravasation of blood occurs into the alveoli just beneath the pleura. Adjoining the consolidated areas there is usually pleurisy, especially over considerable areas of consolidation, binding the lung to the chest-walls. There is also occasionally a moderate amount of exudation into the pleural cavity.

Symptoms.—Bronchopneumonia, as has been said, is almost always a secondary disease, and it is liable to arise in the course of a bronchitis or some one of the contagious diseases—measles, whooping-cough, and diphtheria especially. There is then to be recognized some increment of fever, in the rate of pulse, and especially a difficulty in breathing. The fever is at its height in three to five days, and usually quite irregular in course, above 102° up to 104° or 105° F., or in rare cases even higher. The height of this becomes a fair index to the virulence of the disease. Deaths with low temperature are usual in very feeble children. The rise and fall on the temperature chart is gradual, and feverishness persists for a considerable time. The pulse becomes greatly increased (125 to 150) and the ratio between pulse and respiration is from one to two, or even less. The cough is usually short and hacking, less distressful than in a severe bronchitis and more consciously controlled. The pain felt is less in front, as in bronchitis, and more in the side. The alæ of the nose are seen to dilate, especially in little children. Where atelectasis takes place the dyspnea becomes more marked and the expiration "grunting"; the skin becomes livid and dusky, and, as we have often had occasion to remark, the characteristic symptom here is increased sweatiness of the skin. As the symptoms become severe the child remains more and more quiet, holding its head well back and supporting itself with its hands; it is a characteristic feature that the worse the malady the more submissive is the child. Expectoration is liable to be mucopurulent, but infants swallow and conceal this. Appetite is generally lost but thirst exces-

sive. The suckling of infants is difficult and incomplete, on account of the dyspnea. Strength is rapidly lost and somnolence a very evil sign. Vomiting may occur at the outset, and diarrhea is a bad complication. Irregular fever with high pulse-rate indicates a protracted course, and possibly chronicity. The heart must be carefully watched; a feeble first sound is of gloomy import, though death is more likely to result from respiratory than cardiac failure. In the beginning there are the usual signs of bronchitis—first dry and later moist râles, without dulness. As areas of congestion arise, dulness on percussion may be recognized; but it is difficult to elicit unless pronounced, and then only on using the lightest percussion. These congested areas are best recognized by moving a stethoscope here and there while the child cries, and locating by increased vocal fremitus and resonance. If a lobe of the lung be extensively affected the signs are more pronounced, but ordinarily it will be necessary to explore the two sides symmetrically and estimate by these lesser sounds. Moreover, the symptoms vary from day to day, almost from hour to hour. Characteristic symptoms are oftentimes best heard high up in the axilla. When atelectasis or emphysema is present there is a great variety of changes in the symptoms which may occur swiftly. There are practically no characteristic signs in bronchopneumonia, but if in addition to the râles of bronchitis there is superadded subcrepitation, with harsh or blowing breathing and impaired resonance in the lower part of the lungs posteriorly, and along with these pronounced and increasing prostration, we may regard the disease as evidenced.

Complications and Sequelæ.—Pulmonary collapse is less a complication than a feature to be expected. Sometimes it is so extreme as to warrant the use of the old term “suffocative catarrh.” Pleurisy is rarely a troublesome complication. The most serious sequela is tuberculosis. Bronchopneumonia renders a person peculiarly susceptible to this poison. Meningeal symptoms sometimes arise toward the end of the disorder, probably due to hyperemia of the meninges or to toxemia. Chronic or continued pneumonic process is a serious feature not uncommon. Cases may go on to rapid or slow resolution and yet recovery be complete and thorough. Others suffer relapses or recurrences, and result in a chronic interstitial pneumonia.

Associated lesions of the lung are enlarged bronchial glands, more or less emphysema in almost all cases, gangrene rarely, and abscess more frequently than is suspected.

Diagnosis.—It is important to examine every case of bronchitis critically for the intercurrent of a possible pneumonia, also in the infectious diseases. This may be recognized in sudden increase of fever, acceleration of pulse and respiration, fine subcrepitant râles, blowing breathing, and small areas of percussion dulness. Catarrhal pneumonia may exist with signs of consolidation. If the disease is first seen in a well-developed state it may readily be confused with croupous pneumonia, but scattered areas of dulness in the opposite lung will help to distinguish it, along with the history of the case and its gradual onset. Plastic pleurisy usually accompanies bronchopneumonia, and confuses the physical signs. Where gastro-intestinal disorders or nervous symptoms are marked features the pneumonia may escape attention unless searched for. Here the changed respiration and pulse-rate should be an indication.

The **prognosis** is always bad, the average mortality being nearly fifty per cent. under five years of age, and less over that period. In private practice (Holt) mortality is from ten to thirty per cent. The cases which follow whooping-cough are most serious; also those complicated by previous marked debility. Duration is usually from two to three weeks; mild cases may terminate in a week. The symptoms to be considered in making a prognosis are the height and course of the temperature, the occurrence or absence of neurotic phenomena, the state of the digestive organs, the presence of cyanosis, and the extent and character of the diseased areas, and also whether or not the process follows an infectious disease.

Treatment.—The essential element of treatment is prevention, bronchopneumonia being essentially a secondary disease and controllable in most instances by proper care. The measures used should be early applied. Any case of bronchitis may be complicated by more or less pneumonia. (For treatment, see special article on treatment of pneumonia.)

CHRONIC BRONCHOPNEUMONIA.

Chronic bronchopneumonia, also called **fibroid phthisis**, is a condition of the connective-tissue framework of the lungs following upon other diseases. The condition is known also as chronic or interstitial pneumonia, cirrhosis, or fibroid induration of the lungs, and is usually accompanied by dilatation of the bronchi. It is

generally of one side, protracted in its course, and is characterized by a change from the normal pulmonary tissue to the excessive formation of connective tissue, and is often associated with or followed by tuberculosis. It is held by some that fibroid phthisis begins as a tuberculosis in all instances. It is certainly proven that many inflammations of serous membranes aforesaid ascribed to exposure to cold are really tubercular. This is especially true of the pleura. The affection is rare in children, they usually exhibiting a more active process during an inflammation, with a larger power of complete repair. When seen in adults the origin may frequently be traced to childhood. A simple bronchitis may set up changes which result in an overgrowth of the interstitial connective tissue. (See Chronic Bronchitis.) It is exceedingly uncommon in children to find an abundant connective-tissue growth, the result of an ulcerating tubercular process in the lung, although it is possible. The usual origin of fibroid phthisis in children is in the results of pneumonia and bronchopneumonia, especially the latter. Bronchiectasis, a cylindric dilatation of the bronchi, is also frequently present, due to excessive coughing. An entire lobe may be affected, but usually only a portion of a lobe or areas in the lung, or the walls of the bronchi may be thickened.

Pathology.—The changes in the lung are usually upon one side and in the lower lobes. The parenchyma of the lung appears destroyed and replaced by connective tissue. There is usually peribronchitic thickening, and also bronchial dilatation, producing cavities of varying sizes. Cavities may also be formed through ulcerative change, particularly where secretions are retained and become decomposed. Tubercle bacilli, active or latent, may be found in the tissues or secretions, or locked up in the connective tissue. The lung usually suffers some diminution in size, which is shown upon inspection. The pleura is generally affected, and adhesions are liable to be particularly dense. The sound lung exhibits compensatory hypertrophy and often emphysema. The heart rarely escapes displacement, and the cavities suffer change because of the increased resistance in the pulmonary circulation. A common result of pleural inflammation is adhesive pericarditis; this may be found here, as well as a general venous stasis.

Symptoms.—There is almost always in chronic bronchopneumonia

cough and expectoration, though this varies considerably in amount at different periods. Where cavities exist the sputa may separate into three layers of froth, serum, and pus; it is often most offensive. If tubercle bacilli be found, they may betoken a recent infection from outside or a manifestation of latency. Elastic fibers will be shown if ulceration is present. Hemoptysis occurs, usually of moderate amount; but if a fair-sized vessel be affected, danger results, or possibly death. Even in favorable cases dyspnea arises upon exertion, or even in worse ones, while the patient is at rest. Fever and its effects are absent or occur only intermittently. Should it arise, it is a symptom of some secondary complication. Nutrition suffers little and the general health is fair. That infallible sign of chronicity, clubbing of the fingers and toes, is more constantly seen in interstitial pneumonia than in any other condition, except, perhaps, congenital heart affections. The physical signs are similar to those of chronic tuberculosis. Certain signs are, however, distinctive of this malady. The respiratory murmur is much impaired unless there be bronchiectasis, when the breathing is distinctly bronchial. The two sides of the chest show a notable difference in shape, mobility, and size, especially where pleural changes are extensive. Retraction is more common if the apex be affected. Exploration of the chest may reveal areas of consolidation, retained secretion, or vomicae; and, in this malady, more often at the base than the apex. According to the shrinkage or change in the shape of the chest, or where in the pleura or pericardium adhesions have taken place, there are seen changes from the normal in the cardiac impulse. Other changes, the outcome of altered relationships between the lungs and the heart, may be manifest, but are sometimes very obscure. If the compensatory hypertrophy of the right ventricle suffers, we have evidences of venous stasis, pulsation of the jugulars, edema, enlarged liver, cyanosis, and the like. The course of fibroid phthisis is essentially chronic, and, on the whole, progressive, although there may be periods of fair health, and yet death may occur from intercurrent disease.

The **diagnosis** should not be difficult if a history can be obtained. Chronic tuberculosis is excluded on account of excellent general nutrition, the absence of fever, and the mode of onset. In fibroid phthisis there is a history of chronic cough and expectoration, with repeated blood spittings, physical signs of lung destruction (generally of one

side and often with the formation of cavities), or signs of shrinkage and hardening. The heart exhibits hypertrophy soon or late, with dilated right ventricle. The disorder may be confounded with chronic pleurisy where there is also much contraction of the side. In cancer of the lung or pleura the thoracic physical signs are similar, but the course and duration quite different.

Prognosis.—A sufferer from fibroid phthisis may live a great many years, especially if the patient is in comfortable circumstances, and can or will be reasonably careful. The danger is from intercurrent diseases.

Treatment.—Nothing can be done to repair the damage to the parenchyma of the lung; much, however, can be done to place the patient in good health and keep him there. In the accomplishment of this a judiciously regulated outdoor life, attention to the diet, and, above all, to the skin, will do much to lengthen the sufferer's days. Respiratory gymnastics are capable of doing a good deal in improving the condition of the lung, especially suitable exercises in a wholesome atmosphere. High altitudes are theoretically contraindicated, because of the deficient respiratory capacity. This must be determined in each particular case, estimating the collateral conditions, whether a dry or a moist climate be the best. Expectorants are to be avoided as a routine measure, but must be prompt and efficient when needed. Potassium iodid is useful in certain stages of bronchitis, and creosote or guaiacol will at times serve a useful end. Cod-liver oil is the standby always, and other nutrient tonics—malt, hypophosphites, etc.—are frequently of use.

CROUPOUS PNEUMONIA.

Croupous pneumonia, or lobar pneumonia, is a specific inflammatory disease of the lungs due to infection by the micrococcus lanceolatus (pneumococcus) accompanied by exudation into the vesicular structure with subsequent consolidation. Clinically, it is an acute, self-limited disease, manifested by high fever, dyspnea, cough, and rusty sputum, running a definite course of from seven to ten days, ending by crisis.

Causes.—Lobar pneumonia may occur at any age, but is not nearly so common in infancy as bronchopneumonia, being rare before

the age of two years, and in children is most common between five and ten. Unlike bronchopneumonia, which seizes upon debilitated children, lobar pneumonia affects those who are robust and in vigorous health. Croupous pneumonia may follow, or arise as a complication of, measles, whooping-cough, and influenza, typhoid fever, and tuberculosis, but in children under three years of age this is most unusual. Exposure to cold is the predisposing cause and depressing conditions are contributory, but the exciting cause is the diplococcus lanceolatus (*diplococcus pneumoniae*) of Fraenkel. This microbe holds also close relations with cerebrospinal fever, middle-ear disease, and endocarditis. Among other bacteria causing pneumonia may be mentioned the bacillus pneumoniae (Friedländer) as well as the streptococcus and staphylococcus pyogenes. No doubt other bacteria are sometimes responsible for croupous inflammations, such as the bacillus of typhus abdominalis. There is some reason to believe that this form of pneumonia is contagious.

Pathology.—The lesions of lobar pneumonia occurring in children are much the same as those of the adult, being an acute exudative inflammation, extending throughout the whole of one lobe or the major part of one lung or limited portions of both lungs. The stages are those of congestion, red hepatization, gray hepatization, and resolution, progressively, just as in the adult.

During the first stage, or the stage of engorgement, the lung tissue is congested. It is of a deep-red color, firmer to the touch than normally. On section a frothy fluid exudes, made up of serum and blood. The lung still crepitates, and a cut portion will float. The alveoli contain fibrin, leukocytes, and detached epithelium. The capillaries of the air-vesicles are dilated and tortuous, the alveolar epithelium swollen. The first stage lasts a few hours or several days. When the output of inflammatory products has reached its height, these, collected within the alveoli and terminal bronchi, increase the size of the lung as well as its density; hence the stage of red hepatization. The lung is of dark-red color, solid, airless, and firm. It is easily friable, cuts like liver, and sinks in water. This stage occurs earlier in children than in adults.

Microscopically studied, the alveoli are observed to be filled by threads of coagulated fibrin, in the meshes of which are seen red blood-corpuscles, polynuclear leukocytes, and alveolar epithelium.

The alveolar walls are infiltrated and leukocytes are seen in the interlobular tissue. Thereupon follows a period in which the exudate becomes changed in color from red to a mottled gray; this is called *gray hepatization*, and is a process of degeneration and softening. The air-cells are filled with leukocytes. The fibrinous network and the red blood-corpuscles have disappeared from the alveoli. Finally comes its last stage; in this the exudate is softened. Disintegration and degeneration of the cell elements continues until they are rendered soft and capable of absorption. The lymphatics take up and remove these products, and this is called *resolution*. During the course of an ordinary lobar pneumonia no histologic change takes place in the lung structure itself; consequently recovery occurs by resorption and expectoration of the exudate.

In children lobar pneumonia is frequently bilateral; the lobe most frequently affected is the lower one of the left lung, and pneumonia of the apex is quite prevalent among children, though rare in adults. A bronchitis may accompany the process in a fair proportion of cases. A plastic form of pleurisy occurs where the consolidation reaches the pleura; more rarely an effusion takes place, and empyema may result. Pleurisy of a mild sort is frequently present yet unrecognized; it is less often a complication in lobar than in bronchopneumonia.

Symptoms.—Lobar pneumonia, being a primary process, manifests itself abruptly, with few or no prodromes. The seriousness of the malady is promptly defined by the onset of convulsions, or vomiting, or both, usually a certain amount of rigor or chilliness, with a pronounced rise of temperature. The clearly marked chill, so common in adults, is rarely seen; instead of this the nervous system often loses its balance (convulsions) or a mild delirium appears often, or the stomach rejects its contents. The temperature rises rapidly, and inside of a day may reach 104° or 105° F., continuing with slight daily remissions and declining by rapid crisis from the seventh to the tenth day. It often falls below the normal. The pulse is full and bounding, increasing in rapidity as the temperature rises, but respiration is accelerated in even greater proportion than either, so that the pulse-respiration ratio of one breath to two pulse-beats is pathognomonic in this disease. Pain is usually present, referred vaguely to the chest or abdomen; dyspnea may become a most urgent symptom. A short, dry cough may appear early, which sometimes seems to give rise

to pain. The cough, however, may not come on till later, and changes its character as the disease progresses. There is rarely any expectoration before the sixth or eighth year, and then it may exhibit the rusty character common in adults. The face is often flushed, or circumscribed spots of redness appear on the cheek; the eyes are bright and the facial expression is anxious; the alæ of the nose are dilated, showing increased inspiratory effort. In the milder cases there is restlessness and irritability; in severer ones apathy, at times complete. Appetite is usually lost, and sometimes marked digestive disturbances persist throughout the disease. In certain severe cases the nervous symptoms are prominent throughout, usually in proportion to the height of the fever, and death may occur in a convulsion before even the characteristic physical signs appear. If the nervous phenomena appear at first only, they are of little gravity; if they arise later, they are of gloomy portent. In intensely severe cases the dyspnea and cyanosis develop markedly, the respiration is shallower, the pulse more rapid and weak, the child becomes stuporous, and death occurs quietly or with motor excitements.

The physical signs in lobar pneumonia in children are not so clear as in adults, and yet when present are of much the same character. There is percussion dulness over the consolidated portion of the lung with increased resonance elsewhere. Dulness on percussion is sometimes masked by areas of emphysematous lung overlying the consolidated portion, requiring deep percussion to bring out the flatness. The expansion of the affected lung is seen to be lessened. Crepitant râles are heard in about one-third of the cases, and are best recognized during the long, indrawn breath after coughing. The breathing is distinctly bronchial where consolidation has occurred, and vocal resonance and fremitus are increased—not very trustworthy signs. In the beginning of the disorder fine râles may be heard here and there, more rarely in children than in adults; during resolution moist râles are heard extensively. There is great variation in physical signs and all symptoms; in some cases the cough is absent until many days elapse; the cough and physical signs sometimes remain for several days after the temperature has dropped. The presence of pleuritic exudate produces a dullness, with only a muffling of the breath sounds. There are, moreover, certain varieties of lobar pneumonias which have received special names and vary considerably in their symptomatology, in some cases

strongly simulating meningitis with hyperpyrexia, convulsions, delirium, or coma, and yet without cough or the physical signs of pneumonia. These cases are liable to arise among debilitated children, and the pneumonia is often of the apex. Abdominal pneumonia is a name given to those cases marked by digestive disturbance, vomiting, diarrhea, and abdominal pain. These may be so severe as to simulate peritonitis. The pneumonia in these cases is only to be discovered by careful search. Wandering pneumonia is very like bronchial pneumonia in certain of its symptoms, but not so entirely similar as to fail of a differentiation.

The commonest complication of croupous pneumonia is pleurisy, but it is usually not very severe and may entirely escape detection. The effusion may be plastic or occasionally purulent, especially when following measles and scarlet and typhoid fevers. Pericarditis may complicate the pleurisy or occur alone. The meningeal form, or, better termed, the cerebral form, is very alarming, but rarely does this indicate a true meningitis. Disturbance of the kidneys occasionally arises; abscess and gangrene are rare sequels.

Diagnosis.—When seen in the fully developed form, a lobar pneumonia is difficult to differentiate from a bronchial pneumonia. Wandering pneumonia with areas of fleeting consolidation is even more confusing. The abdominal type of pneumonia is readily overlooked, and here the respiration and pulse-rate must be carefully measured. The suddenness of lobar pneumonia, with its high fever, vomiting, and convulsions, before the physical signs are manifest, together produce a marked similarity to the onset of scarlatina. Pleurisy with effusion is to be recognized by its movable character, absence of breath sounds, râles, and by changes of vocal resonance and onset with pain.

In the diagnosis between the cerebral form of pneumonias and meningitis, it is important to bear in mind that in the former we have rapid pulse and hurried respiration. In meningitis there is usually a slower pulse, with slow, irregular breathing. In lobar pneumonia usually a number of its own characteristic features will appear, to distinguish it from the marked irregularities, slow, insidious onset, irregular temperature, pulse and respiration rates of bronchial pneumonia. The unilateral character of lobar pneumonia will mark its distinction from the bilateral manifestations usual in bronchial pneumonia.

Prognosis.—Bronchial pneumonia in children is a far graver disease than primary croupous pneumonia. In the secondary form of croupous pneumonia, however, it is more serious, yet in the septic cases the mortality is high. Of evil omen, too, are pronounced cerebral symptoms, hyperpyrexia, and great dyspnea, but experience proves that even the most severe cases recover surprisingly. The mortality is about five to ten per cent.,—it is large under three years but very small from that age to ten years.

THE TREATMENT OF PNEUMONIA.

It has seemed to us better to include under the treatment of pneumonia the consideration of both forms common in children,—bronchopneumonia and lobar or croupous pneumonia,—with references, also, to pleuropneumonia and other complications, as there are a number of points common to the treatment of all forms of bronchial and pneumonic inflammations.

When one is confronted with a well-developed case of inflammation of the lungs in a child, it is far from easy, sometimes practically impossible, to differentiate clearly between various forms. In the treatment of such it is imperative to put the sufferer in bed at absolute rest and to control the environment, making sure of a uniform degree of warmth, which should be from 70° to 74° F., with abundant air,—not less than 1000 to 1200 cubic feet for each child,—and to be prompt with means for readily changing the air as it becomes in the least degree vitiated. An open fire-place with fire burning is one of the most perfect devices, in addition to whatsoever other arrangements may already exist for ventilation. Even in a hospital ward air-modification is frequently possible as above suggested, and always to be welcomed. It is a distinct advantage to modify the air of the room, where this is feasible, by some volatile, preferably resinous, principles which are stimulating to the respiratory mucous membrane, especially when dyspnea is a marked symptom. Here it is well to surround the child for a time with a tent made of sheets, such as is used for croup, and in this place a kettle, on which, in boiling water, may be vaporized beechwood creosote, pine-needle oil, turpentine, compound tincture of benzoin, or eucalyptus. There should be as little disturbance as possible in the way of noise, moving bodies, and the like, espe-

cially where cerebral symptoms supervene. The sufferer should be handled as little as possible; frequent examinations are entirely needless, tending to exhaust strength and patience. During the day an abundance of light may be admitted, sunlight being especially welcome. So soon as night falls there should be no illumination excepting such subdued light as is necessary for the guidance of the nurse.

Bathings are of the utmost use, not only for the purpose of keeping the skin in a wholesome continued action, thus relieving the strain on the overburdened lungs, but bathing is also a remedial agent, and enjoys a very important place in the category of remedies, especially during the stage of collapse in pneumonia, usual in the bronchial form. A bath of 102° to 105° F., into which the child may be plunged for a moment, materially assists a failing heart or embarrassed respiration and rouses waning powers. During the course of a moderate fever a bath of 103° to 104° F. and sponging with water of 70° to 80° F. is employed by many, and others give a warm tub-bath. If the temperature be higher than this, the water may be cooled while the patient is in the bath, for the purpose of reducing the fever to a reasonable degree. The fever *per se* may be let alone; it is generally the nervous symptoms which require treatment, and upon these judicious bathing exercises an excellent control. Many times the use of a hot foot-bath, to which may or may not be added a little mustard, will prove an excellent measure in relieving delirium, restlessness, or insomnia. Some recommend the addition of alcohol to a warm sponge bath, and then fanning the skin until it becomes cooler. Some immerse the patient in water of 90° F. for fifteen minutes, followed by constant rubbing, keeping the feet carefully warm the while. There are those who recommend, even in children, the cold pack or ice poultice, and this may be advisable now and again. As has been said, pyrexia is of itself not a matter for alarm, and hyperpyrexia rather indicates profound blood-poisoning, which needs other and more radical remedies than cooling measures. The child should not be allowed to remain long lying on the back.

Clothing.—The clothing of the child should be of wool, as thin as possible but entirely protective in quality and extent. The bed clothing should be of the lightest, and yet sufficiently warm. Thin woolen sheets are best, but a blanket worn next above, with a sheet underneath, does very well, and in milder cases muslin sheets above and below may be used, but linen never. The body clothing should

be so adjusted as to be readily taken on and off, especially the shoulders and chest, by being open down the front and back, so that counter-irritants may be readily applied—poultices or stupes or fixed dressings, according to the requirements of the various states.

Food.—Inasmuch as the strength of the patient is sorely taxed in all forms of lung disease, the utmost care needs to be exercised that he shall maintain every atom of strength by means of food in such quality and amount as shall require no strain on the processes of digestion and yet supply abundant force. For infants, in whom bronchopneumonia is one of the commonest and often fatal forms, instruction has been given as to feeding elsewhere; this should be of the simplest nature for such little ones, whether well or ill, and during the height of the febrile process and well into the stage of convalescence had best be guarded by digestants. For somewhat older children, accustomed to taking solid food, an ordinary fever diet is admissible. This should consist largely of milk, which may also be predigested or guarded by digestants, supplemented by, or alternated with, stimulating broths of various sorts, and, later, semi-solid food, as soft-boiled eggs and meat purées. Only when the fever is well past may a variety be introduced or increased. The very great tendency in some forms of pneumonia to be accompanied by, and some believe caused by, putrefactive agents in the intestines makes it important to be on guard against evidences of disease and to meet them promptly. The bowels must be quickly relieved of any disturbing matter by laxatives or simple enemata, or both, or some antifermentative medicines may be employed to control this tendency.

Stimulants.—While it may not be wise to employ alcohol and other stimulants as routine practice, nevertheless in our judgment it is well to err on the side of prudence and administer alcohol so soon as there is the smallest indication for its use, for, aside from apparently sustaining properties, it many times simulates a food. The most valuable property of alcohol is to act as a tranquillizing agent. This it does particularly well in children and in disorders of their lungs. The form of alcohol used may be a definite amount of whisky or brandy, or some believe that in disturbances of organs of respiration Jamaica rum is peculiarly valuable. For very little infants the milder form of wine-whey serves an admirable purpose, and is certainly less irritating to a disturbed stomach than the stronger prepara-

tions. Some accept more readily the heavier wines, as sherry and port; but champagne, so valuable in adults, is not especially acceptable to children. Aromatic spirit of ammonia is stimulating; caffeine or its preparations, it may be tea or coffee as ordinarily made (or, at least, well made), is of admirable use in failing heart action, sometimes far better than alcohol, indeed, or even strychnin or digitalis. It has a happy effect in certain forms of delirium, alone or along with alcohol a bromid, codein or sulfonal. The ammonium salts are useful as cardiac stimulants as well as for their expectorant properties.

Counterirritants.—There is considerable variety in the opinions of the most eminent physicians as to the usefulness of counterirritants for hyperemia or consolidated areas of the lung. Our own belief is that they serve a very excellent purpose if judiciously employed. Any constant application to the chest, if of considerable extent, is liable to the objection that the skin becomes macerated when moist applications are continued for many hours or days, and this maceration can not but be objectionable in many ways. It inhibits to a great extent elimination from the skin, which needs to be encouraged in every way, weakens the capillary vessels, while at the same time it relieves their tension and renders the skin susceptible to the effects of exposure. The occasional use of poultices has the advantage of acting as an excellent febrifuge as well as relieving the cutaneous capillaries, at the same time determining the blood to the surface and away from hyperemic areas. Our method of using poultices as an occasional practice where there seems an indication for them is this: Poultices should be made moderately thick and quite hot,—about 105° F., or even 110° F. when the patient has become accustomed to their use,—about the thickness of a hand and of a size to cover the posterior surface of the lungs on both sides completely. They should also be covered front and rear with thin cloth, as cheese-cloth, and so adjusted that the child may lie upon this poultice and not be oppressed by any weight upon the chest. This is allowed to remain in contact from a half hour to an hour; then cautiously and quickly removed. Then immediately rub in with the hand, while warm, some counter-irritant, as turpentine, one dram, to sweet oil, one ounce, or camphor oil, or amber oil. This is applied over the surfaces where the poultices lay, and also over the entire chest. Then immediately envelop

the chest in cotton wool, well warmed and dry. The child may now be allowed to remain quiet for three hours, and if necessary this is to be repeated—the poultice on the back, thorough inunction of a counterirritant both back and front, and a fresh layer of cotton to surround the chest. It may be necessary to use this every three, four, or five hours, for the first day, and possibly once or twice applied on the second day. Beyond this it is rarely necessary to make use of local heat and moisture, though occasionally it may be carried on to the third or fourth day. The cotton should not be covered with silk, which inhibits too much cutaneous exhalation; it ought to be changed when it becomes in the least befouled, and, better, after each poultice afresh. It sometimes happens that no poultices are needed; then a turpentine stupe, for a quarter to a half hour, once applied, or possibly twice, is sufficient. These certainly relieve pain when present, and also have an effect upon the bronchitis.

The use of any of these applications may excite the child and do more harm than good. If so, mere hot foot-baths will serve, followed by the silk-and-cotton jacket.

Some authorities use flaxseed poultices, hot, to which one part mustard is added to five or six of flaxseed meal, and applied until the skin is well reddened; then this slipped off and hot, dry flannel placed over the part. For pleuropneumonia or a concomitant pleurisy this form of counterirritation is excellent. Other authorities use a cotton jacket, with or without oiled silk, throughout the attack. To us this seems a rather unattractive measure, but is highly recommended, and is far less troublesome than the systematic poulticing. It may be well to follow active poulticing with the oil-silk jacket, which is certainly effective and convenient.

Medicines.—The use of medicine should be purely symptomatic. It is not well to direct too much attention to the checking of a cough, unless this excites or exhausts the patient; and the cough is relieved in a very great majority of cases by attentions of a local kind—by the use of sprays, application of astringents to the pharynx, upper air-passages, and oleaginous sprays, or vapors containing resinous principles. Opium has not so great an effect in depressing respiration as is often feared, but must be carefully used. Opium is of very great use in relieving the character of the cough; used sparingly, and in certain combinations, it produces a happy effect upon respiration and

delirium. Opium has an objectionable effect upon the intestines, especially where these are disturbed, unless diarrhea should supervene, which is comparatively rare. From $\frac{1}{2}$ of a grain to three grains of Tulley's powder is recommended. Dover's powder in the form of an elixir enjoys the confidence of others. Paregoric has its admirers, and the elixir of opium is one of the best. Two or three well-directed doses are better than continued administration. Syrups of all kinds are to be avoided as a menstruum; a little glycerin with aromatic water, or elixir of pepsin, or simple elixir is better.

Cold is the best antipyretic, but it must be borne in mind that during extremely hot weather a longer application must be made than in cold. If the extremities are chilly, avoid cold baths. During this condition a hot bath is better and more efficient in reducing temperature, because with cool extremities the interior of the body may be hot, and hot baths bring the blood to the surface, thus changing its site and relieving congestion. During the use of cold baths it is wise to apply warmth to the feet in the way of hot bottles. A good form of cold pack is to apply it from the waist down, leaving the arms free, and keeping the feet warm the while. A small baby may be wrapped in a single wet towel and covered with a blanket. This may be repeated every five or ten minutes. If the child be extremely weak, the pack may be left on and cold water poured over it from time to time. Extreme watchfulness must be maintained that the temperature does not drop to subnormal, whereupon artificial heat must be again applied. Feeble babies are better for a warm or hot bath, with tepid pack, using water with or without alcohol; or a warm bath gradually cooled, the little bodies being rubbed the while. The heart may suffer seriously toward the end of pneumonia, and always is depressed, needing stimulation soon or late. Heart failure is better prevented than cured. Alcohol is not the best cardiac stimulant for children, and the disturbed condition of the kidneys generally present renders it unwise to use too freely. Digitalis stimulates both the heart and arteries, increasing peripheral resistance. It is well given in a few good doses and then omitted or lessened. Where an effect is desired only upon the heart spartein or strophanthus is best.

The coal-tar antipyretics have a certain value, to be used occasionally, not so much for the relief of pyrexia as for their expectorant qualities. Phenacetin does this not quite so well as antipyrin, but

each of them assists in the relief of nerve disturbances. Aconite is not altogether free from danger, but relieves the circulation in other ways. Liq. ammonii acetatis, especially in the form of *mistura ferri acida*, has a happy effect in depleted subjects, in those for whom iron is indicated, or in whom there is insufficient urinary elimination or disordered kidneys. For the stimulation of the heart, digitalis, *strophanthus*, and *spartein* each have their place. Also strychnin is to be regarded as a valuable ally. Strychnin, with its happy effect upon the respiratory activities, is frequently given, especially where there is a clear indication for its need as an invigorator of nervous force, and it usually should be used in full doses, from $\frac{1}{800}$ to $\frac{1}{60}$ of a gr., three or four times a day. One of the most reliable remedies is nitroglycerin, which dilates the capillaries and thereby aids circulation immensely. Potassium iodid also has this effect, likewise acting as an eliminant. The ammonium salts have their place and their advocates. Carbonate of ammonia is a good heart stimulant, producing a very brief effect, but liable to disturb the stomach. Chlorid of ammonium is useful toward the end of pneumonia and aids the cellular activities. Aromatic spirits of ammonia is quite as good, and more acceptable for its effect upon the heart. Quinin in the beginning of convalescence seems to exert a peculiarly beneficial effect upon the cough, and sustains the action of the nervous system.

Pulmonary edema requires emptying the lungs by dry cups or an occasional emetic, as apomorphin, gr. $\frac{1}{60}$ subcutaneously, and stimulation of the heart and excretory organs. A sharp purgative will assist in this. (Jacobi recommends the subcutaneous injection of salicylate or benzoate of sodic caffein, one to five grains every fifteen minutes for half a dozen times.) For cyanosis, in addition to the cardiac tonics and vasodilators, the direct or indirect application of oxygen is of the highest value to save or prolong life.

Edema from renal diseases is frequently relieved by pilocarpin, $\frac{1}{20}$ to $\frac{1}{10}$ of a gr. subcutaneously. Hemorrhage occasionally occurs from the lung, but is liable to be due to cardiac complication and is manifested in the trachea or bronchi.

Gangrene of the lung occasionally complicates pneumonia, resulting from the infectious diseases, suppurative processes, or foreign bodies. Here stimulating inhalations are indicated, especially of the resinoids,—tar, turpentine, terebene,—on hot water or nebulized.

Hernia of the lung sometimes occurs, pouting out at each respiratory action. We had a case of this following intubation for diphtheria. The hernia caused little or no trouble and was controlled by strapping, under which was placed, over the hernia, a pad of bichlorid gauze. Should deformities of the chest-walls occur, respiratory gymnastics help more than anything else, and should be continued for months or years. The bronchial and mediastinal glands frequently become congested and inflamed in divers diseases of the thorax, though frequently are the result of protracted bronchial and nasal catarrh, or metastasis from other glandular disturbances, especially in rachitic or tubercular cases. The principal symptoms are those of pressure upon the tracheal veins, or nervous attacks of coughing with crowing inspirations, changed voice sounds, bronchial respiration, dulness over the sternum (upper part), and dulness about the interscapular region. The control of this complication is difficult, and consists of absorbents applied externally, mercurial ointment, or potassium iodid and iodine. Internally, arsenic increasingly, and other aids to nutrition.

PLEURISY.

Pleurisy or **pleuritis** in infancy and childhood is almost always a secondary disease. Sometimes there is inflammation of the pleura without any appreciable exudate. Such cases are called dry or fibrinous pleurisies. More often the disorder is accompanied by an exudation of fluid—serous, serofibrinous, or purulent—into the pleural cavity. When the exudate is visibly purulent the disease is called empyema, or purulent or suppurative pleurisy. Serous effusions are less frequent in children than in adults; very rare under three years. Empyema is much more common in the young than in older folk.

Causes.—The greatest number of cases occur from birth to the fifth year; the next greatest during the following five years up to the age of ten. It appears rather more frequently in boys than in girls, and more often on the left than upon the right side. Pleurisy is generally unilateral. There is usually some recognizable antecedent disease, but this is sometimes not clearly evidenced; it is most commonly a disorder of the lungs, especially pneumonitis. It is possible to find only exposure to cold and dampness the exciting cause, and many believe this to be sufficient. It is probable, however, that such

factors act rather as predisposing causes, reducing the constitutional resistance, thereby preparing a soil for the invasion of pathogenic microbes. Injuries to the chest-walls are also credited with being a sufficient cause. It must also be borne in mind that in children there are fleeting forms of pneumonia lasting but a few days, which may precede or coexist with effusions of the pleura. Recent bacteriologic researches on the pleural exudate have demonstrated unmistakably the presence of the staphylococcus and streptococcus (Koplik), and showing this disorder to be similar to the affection in the adult.

In some effusions, however, no microbic elements are exhibited. At present, we are in a position to assume the diplococcus as the connecting link between the process in the lung and the pleuritic inflammation. The exposure to devitalizing agencies, here as elsewhere, lessens the resistance of the constitution to the host of microorganisms which constantly lurk in the upper air-passages. Our difficulties in accounting for the means and avenues through which these reach so remote and protected a part as the pleural cavity, are frequently almost insuperable. The infectious diseases, various forms of tonsillitis, the exanthemata, typhus and typhoid fever, pertussis, influenza, suppuration, and abscess of mediastinal glands may precede and directly cause an attack of pleurisy. Suppuration elsewhere, with or without a recognizable pyemia, also septic wounds and acute bone disease may bring about a pleuritis. Abscesses in the abdominal cavity or involving any of the viscera, and tubercular disease of any part, may be competent causes for this disease.

Pathology.—In the mild forms of pleurisy so commonly occurring, the membrane at first is congested, red, and covered with a thin coating of lymph. It loses its natural luster. This occurs even in various forms of acute pneumonia. There are scattered a few fibrinous threads or adhesions. Should the process cease here, it is called dry pleurisy. In somewhat severer cases, the fibrin formation is more extensive and diffused over both the pulmonary and costal pleura, causing distinct thickenings. In still worse forms of pleurisy, where the inflammation continues, an exudate is formed which may be in character serofibrinous, fibrinous, or purulent. The last condition is termed "empyema."

This serum or seropus may be much or little; it usually contains leukocytes and, possibly, bacteria; it may be clear, turbid, or opaque;

yellow or green ; and thin or creamy. In large effusions, the heart is displaced and the lungs compressed. Oftentimes, adhesions are so dense as to seal the two surfaces of lung and costal pleura together, forming limited cavities. This binding of the lung and ribs may seriously impair functional activity of the breathing organ. This, in children, however, is rare, except in tubercular processes, and may be entirely recovered from. In tubercular pleurisy, the inflammatory exudate may cause considerable thickening of the pleural surface as well as an output of fibrin and fluid. Here the effusion may be encapsulated by the adhesions, while the lung is progressively crippled and misshapen by the changes. It is not altogether clear whether an acute pleuritis with serous effusion is a separate disease from pleuritis with purulent effusion, or whether the difference between the two is simply one of degree, differing in the amount of pus-cell formation. Practically, it would seem so ; this last form, with the purulent exudation, probably began as such and continued so. The latter is empyema, and the former the true pleurisy.

Symptoms.—The special symptoms of dry pleurisy are pain, sharp, severe, and localized, increased on inspiration ; and the painful areas are usually tender to the touch. The pain may be referred to the abdomen. A cough of a tickling character accompanies most cases. In the dry form of pleurisy, friction sounds are to be heard over the affected spot, generally of a moist or crackling kind, superficial, and not altered by coughing. When this occurs as a complication of pneumonia, the only evidence may be pain. It generally runs a favorable course in a few days or a week. In the purulent variety there are, usually, constitutional symptoms referable to sepsis. Physical signs are, diminished movement of the affected side, bulging of the intercostal spaces ; and if the effusion be large, the measurement of the affected side is increased. If the effusion be considerable, especially of the left side, the apex-beat of the heart is displaced to the right and, possibly, downward.

When pleurisy arises as an acute affection, the clinical picture differs little from that accompanying any acute disease with fever, especially such as affect the chest, as in pneumonia, with which this is usually co-existent. Moreover, one symptom may mask another. There may be a cough from the beginning accompanied by evidence of pain, such as a cry. These symptoms may increase along with dyspnea, and the

later phenomena are those of extreme weakness and emaciation. In the more insidious form, the first febrile symptoms subside, lulling suspicion. Older children may complain of pain now and then, with cough, little or more, yet with an increasing pallor and prostration. The fever may be high from the start (105° F.), or vary from day to day. When the temperature falls, it usually is not quite to normal, and in the following days, should the pleurisy continue, the fever again goes up to 101° or 102° F., remitting in the morning. The pulse is, as a rule, particularly high and tense. Dyspnea is the most obvious symptom. If the chest be touched, there is usually evidence of pain; the child resents being lifted and will prefer to lie on the affected side. Cerebral symptoms may supervene, similar to those in pneumonia.

Prognosis.—This depends on the nature and character of the effusion. In the primary, simple form, prognosis is good. In the purulent form, it is grave.

Physical Signs.—Inspection reveals lack of movement on the affected side apparent in even very young infants; this is in sharp contrast to the labored or hurried motions of the unaffected side of the thorax.

When the exudation is extensive there is also bulging of the affected side; the intercostal spaces are not necessarily prominent; they may be retracted; at least the affected side seems smoother and fuller than the other.

Palpation tells little in children, especially in dry pleurisies or with slight effusion. Absence of vocal or cry fremitus, partial or complete, over the areas of flatness is of much significance.

The percussion note over a thickened pleura or mass of exudate is conspicuously dull or flat, but subject to strange and rapid variations in children. Light percussion skillfully applied is required to bring out surface dulness; whereas, if this is made too vigorously, the undertones of the distant lung mask this in the thin childish tissues. Koplik calls attention to the peculiarly "wooden" resistance to the percussing finger. On the unaffected side the note is exaggerated, even tympanitic.

Auscultation is an uncertain guide in pleurisy occurring in children. We may hear natural breathing sounds above the fluid level; and below that, bronchial or diminished or absent, or the respiratory sounds may

not be much changed even in a chest filled with effusion. There is more or less accompanying involvement of the lung tissues and bronchial tubes, giving rise to râles and altered sounds, but they change most confusingly. Displacements of the viscera, heart, liver, etc., are not so common nor so significant in adults, and are rare in children under three years of age. It is well to note the position of the apex of the heart, however, which is often pushed toward the sternum by large left-sided effusions. The apex-beat is then to be seen at the ensiform cartilage.

Diagnosis.—In dry pleurisy, seldom occurring in children under ten or twelve years of age, we have symptoms similar to the same condition in adults, sharp localized pain increased on inspiration, tenderness on pressure or movement, and a tickling cough. The pain may not be referred to the affected side, but to the abdomen.

In pleurisy with effusion the reliable signs are: Flatness on percussion, immobility, absence of râles or friction sounds, distant bronchial breathing, absence of vocal or cry fremitus, and bulging of the affected side.

From pneumonia it may be distinguished by the lesser temperature and prostration in pleurisy, and the mildness of the symptoms generally.

Localized encapsulated pleurisies are evidenced by characteristic changes in the voice or fremitus over circumscribed areas, dulness or altered percussion note, and especially the wood-like resistance to the percussing finger.

In children, the exudate is liable to become suddenly purulent; hence it is imperative to learn at once its character, which any one can readily and safely do by an exploratory puncture with a stout hypodermic needle, made with strict care and antiseptic precautions. Outline the area of greatest dulness, wash the skin with soap and water, then with alcohol or bichlorid 1 : 2000. Take a strong hypodermic needle, or one specially designed (or a needle such as is used for administering the diphtheria antitoxin); drive this quickly $\frac{1}{2}$ or $\frac{3}{4}$ of an inch (not too far) into one of the intercostal spaces, entering the area of greatest dulness, and withdraw the piston. The nurse must be warned to hold the child firmly, lest by a sudden movement the lung be wounded or the needle be broken off by striking a rib. If no fluid be withdrawn, the needle is promptly extracted and a

clean piece of rubber plaster or iodoform collodion used to cover the puncture. The absence of fluid in the needle does not mean that there is none in the pleura, hence the operation should be repeated elsewhere, at once or on a subsequent occasion. This little operation is almost harmless, nevertheless it must be done with full precautions. The fluid then withdrawn should be carefully examined for bacteria. If chain cocci, staphylococci, or the diplococci pneumoniæ are demonstrated in a serous exudate, we may be prepared for purulent change (Koplik). If tubercle bacilli are revealed, this is of grave importance; their absence, however, does not prove the absence of tubercular infection. The tubercular form, however, is rare in children.

Treatment.—The treatment of pleurisy is in great measure a preventive one, since it is so constantly a complication of various existing disorders, such as pyæmia, the pneumonias, or even of pericarditis and peritonitis, and the acute fevers, rheumatism, and diphtheria. In children, the symptoms are exceedingly deceptive, for among them pain is oftentimes absent, although the one most distinctive symptom in the adult. When pleuritis is established, recognized or suspected, the chest should be immobilized; adhesive plaster is for children objectionable, though efficacious, the underlying skin being liable to irritation. A broad bandage or towel adjusted with safety pins acts better. Cold relieves pain promptly. This may be in the shape of an ice bag applied dry, or cloths wrung out of ice water, or thick flannel which has been laid upon a cake of ice, this again covered with dry flannel or rubber cloth and fresh cold flannel thus laid on frequently. If morphin is used to control pain, it is best given hypodermatically. Dry cupping is useful if it does not excite. Warm or hot fomentations may do better for feeble children. Quinin has a good effect upon temperature, preventing the rise if used in time. It is best given dry and added to a little simple elixir, or in the form of a suppository. Pilocarpin is theoretically useful, but only suitable for vigorous children. If the heart be weak, cardiac stimulants must be given promptly and in sufficient doses. Calomel is useful to relieve the bowels and stimulate the kidneys, along with acetate or citrate of potassium or the iodids. Cases of serous effusion, if not extensive or causing serious interference with respiration or heart action, may be treated symptomatically and recovery follows. If the acute

symptoms progress rapidly and the accumulations endanger life from pressure, the fluid must be removed. The usual method is by aspiration, repeated if necessary in twelve or twenty-four hours. Occasionally, incision and drainage is demanded when the chest is rapidly refilled.

PLEUROPNEUMONIA.

Pleuropneumonia is a separate variety of pneumonia accompanied by an excessive degree of pleurisy along with exceptionally marked consolidation. The pleurisy in these cases usually arises consentaneously with the pneumonia, or it may follow. The cause is more often the pneumococcus. The form is bronchopneumonia in two-thirds, lobar pneumonia in one-third, of the cases. The left lung is affected in two cases out of three, the pleurisy being of both lungs, as a rule, in different degrees. Both surfaces of the pleura are found covered with greenish-yellow fibrin, glueing the opposite walls together, affecting also, probably, the pericardium and the diaphragm. The intensity of the inflammation is liable to cause a fatal result early in the course of the disease. When the chest is filled with pus, a condition of empyema results. The exudate may rarely be only serous. Absorption may take place followed by adhesions, usually extensive. The symptoms differ little from those of pneumonia and pleurisy and chiefly in the degree of severity of the constitutional symptoms, pain, temperature, and subsequent exhaustion. The auscultation sounds are exceedingly puzzling.

The **prognosis** is naturally bad; infants usually die in the acute stage.

The **diagnosis** from empyema or simple effusion is not so difficult if punctures are made. It is difficult to withdraw the fluids unless a pocket be accidentally punctured.

Hypostatic pneumonia can not be readily diagnosed, but commonly accompanies death in infants, from chronic or wasting disease, particularly marasmus. The lesion postmortem is seen to be confined to a superficial strip along the posterior border of both lungs not involving the deeper structures as in atelectasis. This should not be regarded as accounting for the death. There is seldom dulness on percussion, the only sounds being fine, moist râles.

Gangrene of the lung occasionally occurs in feeble children of

poor nutrition, usually under three years of age, and following the course of depressing diseases, particularly bronchopneumonia and measles. The immediate cause is some mechanical shutting off of the circulatory activity in a portion of the lung.

The distinctive symptoms are, the gangrenous odor of the breath and the expectoration of fragments of decomposed lung tissue. Death, however, is liable to occur before these evidences are clear, and the diagnosis is usually made from postmortem findings.

Pulmonary Collapse—Acquired Atelectasis.—A condition of collapse may come upon areas of a competent lung during the progress of pulmonary disease or owing to causes which profoundly disturb the lung circulation or the pressure of air in the lungs.

This may arise from compression or obstruction. Collapse due to compression commonly accompanies pleuritic effusion or pneumothorax, pericardial effusion, cardiac enlargement, deformities of the chest, and thoracic or mediastinal new growths. This may be partial or complete, and becomes less remediable the longer it remains, especially if there exist dense pleuritic adhesions, which last may be the chief barrier to re-expansion. Collapse from obstruction is due to two factors—blocking of the bronchial tubes, great or small, and incompetent respiratory vigor. Holt says this factor has been greatly exaggerated. When a bronchus is obstructed by any cause, usually from a foreign body or from external pressure preventing the entrance of air, that portion of lung beyond this point becomes slowly collapsed; if a primary bronchus, the whole lung; if a lobar division, the whole lobe; if a bronchiole, a small contiguous area. The collapsed portion becomes depressed below the normal surface, is of dark-red color, highly vascular, and resembles pneumonia—in which it may result. Holt, also from large observation, declares that the development of emphysema is much more likely to result from stenosis, due to bronchitis of the smaller tubes, etc., rather than to atelectasis.

Collapse of areas of the lung may come on slowly and generally in feeble infants, rachitic and otherwise depressed, accompanied by bronchitis resembling congenital atelectasis with much the same phenomena. The symptoms are rapid respiration, dyspnea on inspiration, sinking in of the chest-walls, cyanosis, and impaired peripheral circulation.

EMPYEMA.

Empyema or **purulent pleuritis** usually accompanies or follows pneumonitis, especially pleuropneumonia. It may complicate or follow the acute infectious diseases and especially tuberculosis (oftener in children of several years of age), and is a sequel of pyemic states of various sorts, umbilical sepsis, and bone or joint inflammations, appendicitis or purulent peritonitis.

Bacteriologic research has done much recently to add to our knowledge of the causes. The pneumococcus is found in most purulent pleural exudates, notably those following pneumonia; next common are the pyogenic agents, streptococcus and staphylococcus, alone or with the pneumococcus; and, finally, the tubercle bacillus are often present but not so easily demonstrated. Holt says it is most rare for empyema in a young child to result from a serous effusion which has been gradually converted into a purulent one. Empyema usually succeeds that form of pleurisy in which there is first an exudation of fibrin with an excess of pus cells. Sacs, or pockets, may exist or form by slight adhesions in the pleural cavity into which the pus is poured and collected. The subdivisions are large or small, but they tend to become larger and are found usually posteriorly, but also elsewhere in the chest. The sacs may be divided by septa; hence the evacuation of one does not empty the chest, except at that point. The pus may not be all, or nearly all, at the bottom of the chest, but exist merely as a line of half an inch or so in depth at the middle or upper part.

Even where the accumulation is great, the lung does not float on the fluid but is surrounded by it, causing a compression, displacing the heart, diaphragm, and the abdominal viscera; and a bulging of the chest-wall results. If the lung is thus interfered with for a long time, its elasticity is liable to be much impaired, adhesions become dense, and subsequent expansion never perfect. Pus may burrow into a bronchus and discharge. Also, a chronic change takes place in the parenchyma of the lung, producing the so-called "fibroid phthisis." Early and adequate surgical relief removes the possibility of serious damage. Pericarditis is a serious complication in younger, and pulmonary tuberculosis in older children. Endocarditis rarely occurs; so of gangrene of the lung and thrombi.

Symptoms.—The symptoms of empyema are similar to those of a pleurisy with effusion ; sometimes less marked, however, but, as a rule, giving evidence of greater systemic depression ; higher temperature range coming on suddenly and sometimes irregularly. Along with these are found the evidences of effusion in circumscribed areas of consolidation, or narrow tracts, or extensively. Also the usual evidences of pulmonary disease, more or less cough, dyspnea, pain, etc. The pulse is rapid and seldom strong, but not so weak as might be expected. In long-standing cases there are seen evidences of chronicity, clubbed fingers, swelling of the feet, urinary changes, etc.

Diagnosis.—The history of the case, the antecedent or accompanying conditions, will point the differences, as a rule, between a simple serous pleural effusion and the purulent form. "If the child be under three years of age, the fluid is almost certain to be purulent ; and from the third to the seventh year pus is much more often found than serum" (Holt). The exploring needle should be promptly and frequently used, as early differential diagnosis is most important for treatment and prognosis. Pus may not flow from the needle for many reasons—because it is too short, pushed through too far, the pus is too thick, etc. Hence, repeated explorations are to be encouraged under due precautions. (See Pleurisy.)

In empyema there is flatness over the whole lung or lower half with no râles or friction sounds, and the heart is displaced. Auscultatory phenomena are misleading ; the character of the breath sounds is feeble, breathing distant and bronchial.

Prognosis.—When the case is treated promptly and surgically, the outlook is favorable to life. If the condition of the patient be good when the disease begins, it is still more favorable, though age is an important factor ; so is the nature of the essential cause and the early or late stage of the malady.

Perfect recovery can be expected in favorable cases and that without chest retraction or spinal curvature. Where these deformities are marked, there have been errors of treatment, of which long neglect is the chief.

Cases not treated, or not until too late, often die from exhaustion, sepsis, perforated bronchi and choking, tuberculosis or visceral degeneration.

Treatment.—Pus in the pleural cavity must at once be evacuated

by incision and drainage. The aspirating needle is of great service to establish the diagnosis, but is of no value in treatment.

If there be difficulty in introducing a rubber drainage tube of sufficient size to permit the pus to flow freely, a small portion of one or more ribs should be resected.

The pleural cavity must not be washed out, as experience has shown this to be a highly dangerous procedure. Immediate collapse and death of the patient have resulted in not a few instances.

If after a time the lung does not expand and the discharge of pus ceases, an extensive resection of the ribs should be performed.

Estlander and Schede have both devised operations of this character. This allows the chest-wall to sink in toward the collapsed lung and adhesion occurs between the two pleural surfaces.

Delorme has recently had success in four cases by an improvement on these methods. He resects the ribs in line of the skin incision and turns them back with the soft parts as one flap, removes the thickened pleura from the collapsed lung and returns the flap to its place. His operation leaves the lung in a condition to regain its normal expansibility.

CHAPTER XVI.

DISEASES OF THE NERVOUS SYSTEM.

MOTOR EXCITEMENTS.

Disturbances of motion, where movement is in excess and more or less beyond control, are convulsions, spasms, choreic movements, tremors, and automatic movements.

CONVULSIONS.—A convulsion is a temporary overflow of motor impulses, causing wide-reaching muscular contractions, alternating with relaxation. If this alternation is rapid, the convulsion is called clonic; if slow, the contraction being maintained for a varying time, it is called tonic. Convulsions are distributed or general, and partial or local. A convulsion involves a general disturbance of the motor centers.

SPASMS.—A spasm is a more or less rapidly alternating contraction and relaxation of certain muscles affecting a limited portion of the body; is essentially local, and does not involve the nerve-centers as a rule.

CHOREIC MOVEMENTS.—A choreic movement is an irregular, not usually severe, muscular contraction, local or general, but, as a rule, grouped together and simulating more or less closely purposive acts.

TREMOR.—Tremors are rapid, rhythmic vibrations in muscles, very difficult to imitate.

AUTOMATIC MOVEMENTS.—Automatic movements are irregular, involuntary, muscular acts, more or less coördinated and simulating voluntary movements.

Convulsions may be epileptiform, hysteroidal, or tetanic. In epileptic and hysteroidal convulsions, consciousness is disturbed because these emanate from the brain-centers. In the tetanic form this is not so. In epilepsy there is not, as a rule, any recollection of events transpiring; in hysteria there may be, although the subject is

unable to do anything with clear volition. Local spasms are disturbances of motion in the muscles of organic life, such as esophageal, rectal, urethral, and the like. Vomiting is a local spasm; so are certain forms of nervous cough. Spasms of voluntary muscles produce such effects as laryngismus stridulus, child-crowing, and the like.

Tremors may be choreic, hysteric, and that form seen in habit-chorea, as well as due to organic disease. Choreiform movements may be local as well as general. Automatic movements are of rather wide variety, due to hysteria, habit-chorea, and such like disturbances, partly organic and mostly functional, occurring sometimes in epidemics.

CONVULSIONS.

Synonym—ECLAMPsia.

Convulsions are not to be looked upon as constituting a distinct disease, but as symptoms of many morbid states affecting diverse tissues and organs, and consist of a series of involuntary alternating contractions and relaxations of certain muscles, paroxysmally, and sometimes, when severe, accompanied by partial or complete loss of consciousness. They may be the direct cause of death, or merely the terminal phenomena.

When convulsive seizures are repeated at more or less regular intervals the disorder is called epilepsy; but this again is merely symptomatic of varying pathologic states.

Instances of eclampsia are of such gravity and importance that they demand always careful consideration as to their point of origin, causation, nature, and treatment.

Convulsions are especially common in infancy and early childhood, evidencing cellular disturbances in nerve-centers, and are regarded as similar to, or replacing, delirium, or merely analogous to the prodromic chills in adults. They may occur at any age, but when after the second year are of more serious import.

Origin.—Convulsions, local or general, arise in excessive and irregular discharges of nerve-centers in the cortex or base of the brain. Nothnagel suggests a convulsive center in the cerebrum.

The seat of discharge in convulsions is presumably in the ganglion-cells of the brain, and the molecular disturbance in these cells necessary to the morbid discharge is determined either by direct irri-

tation of those centers or reflexly. The phenomena have to do with exaltation of the lower centers or loss of inhibition in the higher centers, or both.

Causes.—Infants have their nervous systems in process of rapid development, "only the component but undifferentiated parts of which are in great activity, ready to receive, and reënergize limitless new impressions." This may be done systematically and wholesomely, or irregularly and excessively; resulting in growth and development, or explosively producing harm.

At birth the lower centers only are developed, hence control is limited until the higher centers become competent to exert inhibition. In the earlier months of life convulsions are common, less so after two years of age.

It is rare, perhaps impossible, for a healthy child to suffer from convulsions, unless the exciting cause be overwhelming, such as trauma, an intense irritant, or poison.

Convulsions readily occur in children of unstable nervous equilibrium. This alarming condition may arise from inheritance or become acquired, and is of very varying degree. One convulsion predisposes to another, and the habit may become fixed.

Some families are especially prone to motor excitements or offer but feeble resistance to excitants, be these physical or psychic. Again, individuals vary from time to time and are rendered susceptible by depressing causes, nutritional and emotional, as well as by definite disease.

Exciting causes are chiefly reflex from peripheral irritations, inducing overactivity in convulsive centers. The history of many of these must be received with caution, since deeper causes can usually be found where careful search is made, more probably several causes acting together: Vasomotor instability, temporary or prolonged, states of anemia, variations in blood-supply and quality, along with certain special nerve irritations as that of the fifth or gastro-intestinal supply, and rickets.

Determining causes are such as disordered dentition (fifth nerve) or the visceral sensory distribution (gastro-intestinal), the various infections, especially whooping-cough and other poisons, both ptomains and leukomains, uremia, malaria, heat, febrile states, burns, cold, fatigue and depressing influences, blood-loss, shock, emotions,

fright, anger, etc. Convulsions—and these the more serious ones—are also due to various forms of cerebral disease, hemorrhage, internal pressure as from rapidly increasing hydrocephalus or abscess, and emboli and thrombosis, and, above all, rickets.

Symptoms.—Almost any one of moderate intelligence will readily recognize a well-marked convulsion or even a convulsive tendency, but it is of the utmost importance that the first observer shall carefully note and be able to relate accurately the starting point and phenomena of progress, the degree of severity, and the length of time it has persisted. On these facts will depend a proper diagnosis of the character and seat of the irritation. The slightest twitching of the thumb may indicate irritation or disease near the thumb center. So of twitchings of the eyelid, or movements in and around the corners of the mouth. Unilateral convulsions, however, do not necessarily indicate a local lesion. There is usually some prodromal symptom, more or less brief, such as the slight twitchings alluded to in the muscles of the extremities or face, a general restlessness, and startings upon slight irritation from touch or noises. Immediately before the convulsion there is often pallor, a fixity of the eyes, or they may be rolled up into their orbits; these slight, isolated movements may pass into convulsive twitchings, extending rapidly over the entire body, or shifting from one side to another, or from one limb to the opposite one along with, or alternating with, movements in the face or head, retraction of the head, or rolling of the body over to one side or the other. A succession of grimaces due to contraction of the facial muscles may be the only change seen; or later the hands may be clenched, the thumbs being buried in the palms; the great toe extended downward; or these phenomena again may be followed by a general commotion; frothing at the mouth; disturbed respiration and pulse, slow or rapid, usually irregular; sweating of the forehead, and blueness of the lips and face. The sphincters may become relaxed, urine and feces being passed involuntarily. After the fit there is usually evidence of prostration, and temporary palsies not infrequently follow, due to exhaustion of the nerve-centers. One attack of convulsions is commonly followed by others, exhibiting an increasing susceptibility. Convulsions coming on in a child previously well point to some acute disease of exceptional severity, or possibly acute meningitis. Convulsions occurring in most forms of brain disease are not usually accompanied by marked temperature

rises, but are liable to exhibit pupillary changes, strabismus, rigidity, or localized palsies.

Prognosis.—In estimating the dangers resulting from convulsions it is necessary to consider the nature and extent of the cause. In children of a markedly unstable nervous equilibrium a convulsion may mean little or nothing. Moreover, convulsions occurring in young infants are of small import. Fits appearing as prodromes of acute febrile diseases are rarely serious and may not even indicate an unusually severe attack of the disease. Those points on which one is likely to base a serious prognosis are extremely prolonged or frequently recurring convulsions, also profound disturbance of the circulation, stupor, or subsequent prostration.

Treatment.—Convulsions from whatsoever cause require prompt and efficient treatment. They themselves may produce serious damage accompanied as they are by hyperemia of the brain, more or less asphyxia, congestion of the lungs and of the various internal organs, thus throwing a great strain upon the heart, its valves, and upon the capillary vessels, and profoundly exciting the nerve-centers. This tremendous disturbance may go on if unrelieved and result in death. The general plan of treatment now to be outlined will do no harm and probably relieve most of the commoner causes which induce the motor excitement. When a physician is called to attend a child in convulsions he should set out instantly and be prepared to remain as long as may be necessary. He should have ready to his hand certain articles enumerated below, or send for them while on his way to the case, making sure that they arrive promptly. A good plan is to send the father or other person most alarmed or least useful. The articles required are a bottle of chloroform or ether (or the mixture we use in whooping-cough: Amyl nitrite, one dram; chloroform, three drams; ether, five drams); also a bottle containing a solution of chloral, 5 grains to the dram, a cylinder of oxygen, a hypodermic syringe, morphin, a gum lancet, a soft rubber catheter, a fountain syringe, a clinical thermometer, a bath thermometer, and three or four rolls of cotton wool.

On reaching the scene of action let him direct the bystanders to get various objects which may be needed, sending one person after each, and thus clear the room, collecting blankets, sheets, large towels (preferably bath towels), mustard, hot water, a bath thermometer, etc.

The child will usually be found already in a bath, which is often so hot as to injure the skin, producing sometimes quite serious results among panic-stricken folk. Take it out at once. If the bath contain mustard, it may be so strong as to require rinsing off, and the application of some emollient, as petrolatum, and to wrap the child up in soft cotton wool, which in any event is a useful covering after the bath. If the child has not been overtreated by domestic zeal and remedies, proceed to apply a hot pack at once, to which a little added mustard is useful (a teaspoonful to the quart of tepid water, 75° or 80° F.), in which dip a large bath towel or sheet and wrap around the child, covering it with a blanket, and leave it thus for from ten to twenty minutes. Meanwhile apply the chloroform or ether to the nose, and give a large injection of hot water— 95° or 100° —to the bowel. While the child is thus resting one can proceed to examine into the history of the case, explore the lungs and heart, and, when possible, get specimens of urine and examine for albumin. Look into the nose or ears for foreign bodies, etc. Examine the penis for phimosis, the gums for an approaching tooth requiring lancing. The temperature should also be taken; if subnormal, use stimulants. The hot injection acts well, helping to relieve the overtaxed heart to equalize the circulation, dilate the peripheral vessels, and also assists in unloading the bowels and intestines, or at any rate in liquefying the feces. If the temperature be found high, the heat will relieve capillary congestion, relaxing the superficial vessels, and expedite heat elimination. The hot injection can be followed later by colder injections, 70° or 55° . Also in hyperpyrexia—and indeed in most cases except shock—it is well to apply cold to the head. If the convulsion be very excessive or unduly prolonged, there need be no hesitation in using a hypodermic of morphin to a six-months-old baby, $\frac{1}{48}$ of a grain; to a babe of one year old, $\frac{1}{24}$ of a grain; or two years, $\frac{1}{16}$ of a grain, and these may be repeated in an hour or two if no effect is gained. The second dose may be double the size of the first, for during convulsions the tolerance of opium is very great. Where there is asphyxia, oxygen is a valuable agent; this is best administered to infants directly through a large face piece and one straight tube. Also chloral may be given by the rectum in warm water or milk, four grains to a six-months-old baby, six grains to one of a year, and repeated in an hour.

Gradually a knowledge can be acquired of what the definite cause

may be, whether shock, fright, chill, heat exhaustion, sunstroke, congestion of the lungs, toxemia, overloaded intestines, the beginning of an exanthem or other fever, or cerebral disease.

It is proper also in most cases to administer a purgative by the mouth, as calomel; or, if the constipation be obstinate, croton oil, a half drop to a drop in glycerin oil or whisky. We have seen this save life when the cause was coarse, undigested food partaken of three days previously, and the child had been abandoned to die. If the temperature remain excessively high, a cold pack may be used after the hot one, and whatever other remedies the nature of the case may require. A child who has had convulsions, especially if these exhibit a tendency to recur, must be kept absolutely quiet and fed in the simplest fashion, altogether by fluids, for several days. When the nature of the case is clearly revealed, one proceeds to treat that as required.

TABLE OF CAUSES OF INFANTILE CONVULSIONS (FROM T. M. ROTCH).

<i>Central.</i>	<i>Peripheral (Reflex).</i>
(1) Diseases of high temperature (insolation, meningitis, the exanthemata, pneumonia, and others).	Rachitis.
(2) Diseases accompanied by vascular stasis (pertussis, cardiac diseases, tumors, hydrocephalus).	Food.
(3) Diseases characterized by anemia and exhaustion (loss of blood, diarrhea).	Intestinal parasites.
(4) Various toxic causes, such as drugs or uremia (belladonna, nephritis).	Dental irritation.
(5) Organic central lesions (cerebral paralysis or any other lesions of the brain).	Foreign bodies in the ear and nose.
(6) Presumably organic disturbance of the brain (epilepsy).	Hot baths.
	Mental disturbances, such as fright, and numerous other causes.

EPILEPSY.

Epilepsy—the falling sickness, *morbis sacer* of the ancients—is a syndrome or a collection of symptoms, rather than a disease. It is one of the hereditary diseases or disorders of the nervous system, characterized by paroxysms of unconsciousness, associated with or occasionally without convulsions.

The causes of epileptic seizures are of infinite variety. In the majority of cases epilepsy begins before puberty, and rarely after the twenty-fifth year. Heredity plays an important rôle: thirty-five per

cent. of Gowers' cases were due to heredity. Families in whom neuralgia, hysteria, insanity, or any other neurosis prevails, are most liable to fall victims to this malady. Any cause which impairs the general health and exhausts the nervous system acts as a predisposing influence. Chronic alcoholism, syphilitic taints (in parents), trauma existing from childhood, infectious diseases of childhood, reflex causes, intestinal worms, disordered dentition, adherent prepuce, foreign body in nose or ear, have been claimed by eminent clinicians as predisposing factors.

Epileptoid disorders are now becoming more carefully differentiated and grouped into such classes as can be shown to have a common cause,—for example, hysteria, which imitates so closely many diseases, puerperal convulsions or eclampsia, uremic convulsions and other toxemias, the common convulsive prodromes of the infectious diseases, and certain degenerative processes.

The name epilepsy is given to a large group of convulsive disorders, the causes of which are unknown, though they may be shrewdly suspected by reason of facts which are progressively less easy to interpret. Where a local area of the brain-cortex is disordered sufficiently to produce irregular discharges, it is called "focal epilepsy." These cases may be explained by a focus of inflammation, or a new growth, or an injury to the skull.

In a smaller group of epilepsies the cause can not be differentiated, and these are still misdescribed by the term idiopathic.

It is generally admitted (certainly this is our conviction) that a predisposition to convulsive states is required for most causes to act upon, and this is especially true for reflex causes.

Instability of nervous equilibrium will render one child vulnerable to slight motor influences, whereas another similarly or even worse exposed may escape convulsions.

Causes.—The causes of epilepsy are various. Focal epilepsy is recognized to be due to a demonstrable lesion, injury, or new growth. The idiopathic forms are explainable upon some conditions of degeneration, the results of hereditary or congenital states, and not capable of graphic postmortem demonstration.

Alcoholism in the parents is potent to induce the degenerative processes, or to further impair nervous stability and increase an existing susceptibility. It is our conviction that when all things are consid-

ered, alcohol is an agent responsible for a much larger number of instances of degeneration than any other single agent.

Morbid Anatomy.—Gross deformities, such as absence of a part of the brain (porencephalia) or areas of changed consistency (sclerosis, softening, or the like), are to be classed under proper heads. These contribute to the production of mental impairment or destruction. In chronic epilepsies there have been found areas of sclerosis,—especially in the horn of Ammon (Ferè),—neuroglial sclerosis (Chaslin), a real gliosis or proliferation of the neuroglia.

Pathology.—The one most conspicuous factor in epilepsy is the convulsion, an explosion of nervous discharge from the brain-centers. The convulsion is apparently dependent upon the cellular instability in the motor centers. Trivial irritation of these centers causes the epileptic fits. This is accompanied by a loss of consciousness and various physical disorders. The more important feature by far is the psychic disturbances.

Symptoms.—The most graphic feature of epilepsy is the fit, which is an explosion of nervous force, along with attendant phenomena. These are of two distinct varieties—major attacks, *grand mal*, and minor attacks, or *petit mal*. It is only too common to find those who suffer from both varieties. While there is, even in the same individual, a sliding scale between these two varieties, yet there are very distinct differences, especially in the line of prognosis—the lesser attacks being much more difficult to control. During the interval there is little or nothing to distinguish the sufferer from a well person. The disorder consists of an ever-present tendency for the victim to suffer from a fit or convulsion, brief or protracted, accompanied by psychoses of the gravest importance. In most cases (and they are the fortunate ones) there is a distinct warning, more or less definite, and extensive. Those who possess this are enabled to seek a place of safety before the attack overmasters them; they are also enabled to use remedies which are sometimes successful in warding off the worst. These prodromes are sometimes vague sensations referred to the stomach, or curious sensations—as formications in the extremities. At times these consist of slight twitching movements or mental or emotional states, restlessness, irritability of temper, or excitement. Sometimes the vision is affected or other sensory auras exist. The chief symptoms of an attack of

major epilepsy are thus arranged by Sachs, in their order of importance and their usual occurrence :

(1) Prodromes, generally of a sensory character. At times there is a vasomotor or psychic disturbance.

(2) Initial cry.

(3) Loss of consciousness (very sudden).

(4) Pupils dilated ; no reaction.

(5) Tonic or clonic spasm of muscles (unilateral, partial, or general).

(6) Spasm of respiratory muscles, which may lead to asphyxia.

(7) Spasm of the muscles of the jaw (biting of the tongue, bloody foam).

(8) Spasm relaxes, movements become clonic and then intermittent.

(9) Involuntary passage of urine or of feces.

(10) Gradual recovery of consciousness, followed by a prolonged stupor or profound sleep.

In a disorder which offers so many possibilities for accidental extraneous damage it is most valuable for the sufferer to obtain adequate warning. In a reasonable proportion of cases this is furnished usually by certain sensory phenomena, or it may be slight movements ; others may evidence excitement, irritability, or aphasia ; the kind of aura may act as a key to the form of seizure, or point to the cause. When the aura is clear and rightly interpreted by the patient, an invaluable opportunity is afforded to seek a place of safety or otherwise prepare for the oncoming period of unconsciousness.

Partial or unilateral epilepsy points toward foci of organic mischief. General convulsions rather indicate hereditary or idiopathic forms. The localized convulsions may at any time become general, and then there is practically no ground for differentiation. It is wise to search carefully into the history of every case for hereditary or parental causes, and into the personal history of possible trauma during birth, and the exact form of attack as indicating possible organic brain trouble. All this will potently influence both prognosis and treatment.

In a certain number of instances the attack is almost altogether motor and occurs during sleep. This is called by Lloyd "somniac epilepsy," a better term than "nocturnal," as it is during sleep the attack occurs, be this of day or night.

Masked epilepsy is that variety in which the sensory and motor features are replaced by psychoses, often mere vagaries, but sometimes maniacal outbreaks. These cases are often most obscure and require close study and emphatic warning to parents and caretakers.

By far the most important symptoms of epilepsy are the psychic phenomena. "Epilepsy is much more than a fit; its essential factor is a widespread, degenerative process which involves not only the sensory and motor cortex but also the highest intellectual centers of the brain" (Lloyd).

In certain cases disordered mental states accompany the aura; confusion, fear, or anger arise, which pass into the convulsion or stupor.

Episodes of maniacal fury may replace the ordinary features of the paroxysm, or pass into other forms of mental derangement, as of confusional states, delusions, or moral perversions. Masked epilepsy or moral mania may follow the paroxysm, hence we have pre- and post-epileptic states of a most important and dangerous character, and belonging as an essential factor to it.

Many of the large viscera are affected, impairing function and jeopardizing life. Digestion is frequently disordered, especially after the fit, as well as loss of control over sphincters and transient albuminuria. Gastro-intestinal disorders also precipitate the fit, and the removal of these changes both its severity and character.

When the disorder has begun in early life various stigmata of degeneration are often seen, such as asymmetries of cranium and face, stunted growth, poor teeth, low-type ears and genitalia.

Diagnosis.—In epilepsy the aura, suddenness of the attack, and loss of consciousness accompanied by tonic and clonic spasms, are distinctive features. If these are repeated at more or less regular intervals the diagnosis is conclusive. Exaggerated deep reflexes in one-half the body indicate a preceding hemiplegia as the cause.

Hysteria simulates epilepsy, but there are obvious points of difference in the history, etc. Uremia induces fits very like the disorder, but is to be recognized by the history and urinary analysis. Organic brain-lesions induce convulsions closely resembling epilepsy. In these cases are also paralyzes of motion and sensation, optic neuritis, vomiting, acute mental symptoms, headaches, and the special history.

Reflex epilepsy in children from gastro-intestinal disorders occur

in those who are strongly predisposed to convulsive states or already damaged by infectious diseases.

Possibly a cure can be effected here before the condition progresses too far.

Prognosis.—A cure is possible in a few favorable cases not dependent on gross brain changes. In chronic cases, from whatever cause, little hope can be held out, although no effort must be spared to strive to control the convulsions which in their progress work mischief, and it is always possible that a good result may be achieved.

Surgery affords increasing possibilities year by year. We have seen one case get entirely well, although morbid impulses remained. The outlook is, however, far from brilliant.

Treatment.—The treatment of epilepsy should always embrace two considerations: One directed to the prevention of the attack, and the other to the control of the nervous discharges or overaction of the cortical cells. As has been shown, grave instability of the nervous cells renders them extremely susceptible to potent irritants of all sorts, psychical and physical. Every means should be employed to maintain the patient on an even plane, in a wholesome equilibrium. All occasions for gross disturbances should be avoided. Overcrowding, close atmosphere, extreme excitement, digestive disturbances, are in themselves capable of precipitating an attack. A sufferer from epilepsy should live a life of great regularity, provided with suitable amusement, occupation, and education, and be kept as much as possible in the open air. The organs of digestion should receive especial and unremitting care. A single indiscretion may bring on a fit, neglect of bowel evacuation, and, above all, if intestinal putrefaction take place this may not only induce an attack, but actually be the starting point of the disease in one so predisposed. The skin should receive adequate attention and cool bathing; sea baths and sometimes hot or medicated baths are valuable auxiliary measures. Sleep should be undisturbed and sound. Tranquillizing medicines had better be given increasingly toward night. Above all, there should be secured moral and mental tranquillity and contentment. By such means as these alone the seizures may be markedly lessened in severity and oftentimes in numbers. Many reflex sources of irritation have been accredited with the power of producing the disease, such as eye-strain, disordered ocular muscle balance, refractive errors and the like, adenoid growths,

laryngeal irritation, adherent prepuces, intestinal parasites, and the whole train of reflex irritations are more or less efficient as well as instrumental causes to be removed or sedulously controlled.

Of drugs, the bromids have held first place in spite of all rivals. They are not curative, strictly speaking, but through their use some cases have recovered. At least, the use of bromids, especially if judiciously administered, with proper regulation and safe-guards, mitigate most admirably the severity and number of the attacks, not seldom keeping them off successfully, and enabling the patient to be a useful citizen. The action of the bromids is generally held to be chiefly that of motor depressants, checking the overexcitability of the cortical cells. There is evidence to show that they exert another quality by lessening the activity of the toxins circulating in the blood, which, at or near a convulsive seizure, are distinctly more virulent. Of the form of bromid the salt of potassium is most widely used, but that of sodium is even better, and of lithium better yet; ammonium bromid may be used; a mixture of several bromids is claimed to be of exceptional value, and it is usually best to use them in combination. Much has been claimed for the bromid of strontium. The best menstruum for the bromids is an essence or elixir of pepsin. It is also well to give along with these both arsenic and iron, not only for their action in overcoming the depreciating effects of the bromids upon the blood, but for their own tonic properties. The doses of the bromids should be adjusted to secure a definite effect, increasing or lessening them as they exert a recognizable influence over the fit. There is also another rule useful to remember, and that is to give the doses increasingly toward night, with the largest dose at bedtime,—both because the patient is better for thoroughly sound sleep and also to mitigate the disagreeable effects which the drug may exert throughout the waking hours. Children bear the bromids well. Other drugs are useful for their tranquillizing properties, and are often added with value to the bromids, namely, antipyrin, iodid of potassium, belladonna especially, and also chloral hydrate, acetanilid, and a host of others. Along with a bromid powdered charcoal in essence of pepsin or pancreatin is useful in fermentative dyspepsias. To replace the bromids for a shorter or longer period, sulfonal serves a good purpose, and trional also, and occasionally the opiates or codeia with great caution. Changes in drugs must be frequently made, and most cases improve surprisingly with every change for a time.

Drugs which have the effect of lessening connective tissue or neuroglial proliferation exert a peculiar influence, among which are the iodids, various preparations of mercury and arsenic, nitrate of silver, and zinc.

CHOREA.

Chorea, chorea minor, or St. Vitus' dance (Sydenham's chorea), is a functional nervous disease of childhood and early adolescence, characterized by sudden, rapid, irregular, and involuntary twitchings of some or all of the muscles of the body, and by a deficient control of the muscles affected.

The movements produced are unexpected and can not be accurately imitated nor voluntarily checked for any length of time. Attention or excitement may increase them; so, indeed, does the effort to restrain. This difference may mark the type or alternate more or less.

In milder forms the twitchings are brief, but in a few instances the movements are so large and violent as to imperil life or limb, and by the constancy of passive muscular acts tend to exhaust the sufferer most profoundly. This exhaustion must not be overlooked in treatment and plays a part in all cases.

Two classes of movements are recognized: In the one these lessen notably on voluntary movement in coördinate acts (passive chorea), and in the other they greatly increase, often rendering the result of attempted effort impossible (intention-chorea). The disorder is more apparent in the extremities, most commonly in the hands and muscles of the face and tongue, producing grimaces, especially while talking. The lower limbs are also much disturbed, rendering locomotion peculiar, producing a characteristic awkwardness, and oftentimes an uneasy fidgeting about the body and shoulders. One of the commonest tricks is for the arms to jerk suddenly back while making an effort to reach for an object, and in another the face-muscles are distorted, causing a most imbecile appearance, with which chagrin at failure has much to do.

The endeavor to stand still often controls the movements for a few seconds, to be followed by greater intensity of the disordered action. Chorea may be of one side only (hemichorea), in about one-third of cases (Starr), and recurrences are liable to arise in the same limited

way. In two-thirds of cases the ataxia affects both sides, or in a few instances it is bilateral but greater on one than on the other side.

In rarer cases there is but slight movement and marked muscle paresis. Speech is often disordered (dysarthria), due to choreic action of the muscles used in articulation and also in respiration. The rare instances of laryngeal chorea cause sounds to be emitted like the yelping of a dog, but these should not be confounded with hysterical barking.

The mental disturbances described by some writers as occurring in chorea are much more likely to be due, as Sachs points out, to exhaustion; and the irregularity of temper is a natural sequence of the long and exasperating agitation of both body and mind.

A frequent complication of chorea is rheumatism, by many ascribed as a cause in about one-fourth of cases; the most serious complication is disease of the heart, which may be and usually is due to the same factor. Rheumatism in a child is not readily recognized by temperature and swellings, but must be searched for among the more obscure symptoms, as fleeting pains ("growing-pains"), and joints becoming tender upon pressure.

Causes.—Chorea is a neurosis of childhood and youth, occurring from birth to late old age, but oftenest at or about the thirteenth year, the majority of cases between five and fifteen. Hereditary predisposition is a marked factor, as well as descent from choreic parents and also those who are sufferers from epilepsy and migraine and other neuroses.

Females are three times more subject to chorea than males. Season exerts a marked influence, by far the largest number arising in the spring (May to July; next, December to February). (Morris Lewis, Weir Mitchell, and Starr; but Putnam and Gowers do not confirm this view.)

Anemia is at the foundation of many cases, and is certainly commonly found associated closely with the disorder.

The direct causes of St. Vitus' dance are fright, overwork such as study, rheumatism, and the acute infectious diseases. Fright is the most powerful for harm, and many instances are recorded in which this seems the only accountable reason. In at least one-third of the cases it has been shown to be the exciting cause. Various peripheral reflex causes are pointed out as causal factors, especially gastro-intestinal disturbances, ocular defects, nasopharyngeal growths, etc.

There is a similarity in the causal factors of both chorea and rheumatism, and these may produce the one or the other.

Neurotic heredity is an important factor.

Heart disease also often precedes the neurosis.

The relation of chorea and epilepsy is most interesting and warrants further study.

Symptoms.—Chorea comes on gradually, as a rule, by slight irregularities of movement, purposeless, and increasing steadily or suddenly. The child drops objects and is considered awkward, may trip and stumble, and make strange faces. Fully developed chorea is unmistakable and obvious. Movements usually cease in sleep.

The heart in all cases should be repeatedly and most carefully searched. Mitral regurgitant murmurs are commonest. Aortic disease is rare. True, these do sometimes entirely pass away, and it is impossible to be sure of organic disease existing, especially as anemia is a frequent accompaniment of the disorder as well as slight dilation of the heart. It is possible some of these murmurs may be due to chorea of the heart-muscles. The urine is frequently loaded with uric acid—an indication of profound disturbance of nutrition.

Subcutaneous nodules, occasionally seen, have a probable origin in rheumatic states. The whole clinical picture in chorea is of an irritable, miserable child, not ill, but wretched and below par, poor appetite and sleep, exhausted, often apathetic, and at times suffering pain from headaches, etc.

The average duration of chorea is put at about ten weeks, and recurrences are frequent at short or long intervals,—often two or three, and as many as eight times (Sachs). Weir Mitchell teaches that during spring and fall these sufferers should be kept under observation for preventive treatment before the usual times for recurrence.

The relapses vary greatly, from a few weeks to as many years, usually of medium type, but not always. They may recur in similar form but often of quite different character of movements.

In certain recent studies of choreiform movements by Weir Mitchell and J. H. W. Rhein, the conclusions are as follows:

1. There are cases which show, some at one stage, some throughout their course, absence of movement during rest. The movements, mild or severe, are developed only during muscular acts.

2. Others in whom continued movement is greatly increased during intentional effort.

3. In certain cases the movement disappears during intentional muscular acts.

4. Others again appear unaltered by voluntary muscular acts.

5. In a few cases the various types alternate or shift.

A tremor exists in some cases of chorea, replacing in part the ordinary movements, or this may coexist with them.

In some few cases the movement is rhythmic and vibratory, resembling a large tremor.

The **diagnosis** is usually easy enough. The character of the movements is so clearly marked as to serve all through medical phraseology as a descriptive term, such as "choreic" or "choreiform." Sachs calls attention to the "facies" of chorea, of which the chief point is the peculiar attitudes of the protruded tongue.

Weir Mitchell long ago called attention to a variety of incoördinate movements following cerebral paresis or descending atrophies, to which he gave the name of "postparalytic chorea."

Writers have variously discussed this *pro* and *con*, but some of the best observers admit that the resemblance of these mobile spasms to true chorea are so close that differential diagnosis, aside from a history of cerebral origin, is almost impossible. The points for contrast are the reflexes (increased in cerebral trouble), contractures, rigidity, etc., not found in uncomplicated functional chorea. Where chorea is persistent it is often possible to find evidences of cerebral lesion. This form of chorea is not so common (six per cent. of cases) as athetosis in the cerebral conditions.

Pathology.—No end of structural lesions of the brain have been accused of giving origin to chorea, but the contradictoriness of these have negatived their value. Most of the changes described are secondary to various precedent conditions, and in the younger cases as a rule, but also in children old enough to have had various lesions.

The changes observed are mostly cortical, and there is usually some change in the gray matter of the central nervous system. The tendency is to regard chorea as due to primary vascular changes which may be dependent upon infectious processes.

Treatment.—Whatever view we may take of the origin of chorea, it is probable that each case has more than one factor in its causation,

along with varying individual susceptibility, nervous stability, age, and season. Chorea is, in its manifestation and course, a motor excitability producing exhaustion; and while usually terminating in full recovery, soon or late, nevertheless a certain number suffer recurrences, and a few are marked for life. If the rheumatic element appear prominently, as it does in one-third of all cases, exceptional care and imperativeness must be exercised to eradicate it. Watchfulness is needed lest it should suddenly appear and produce serious heart lesion; hence a greater caution is demanded than is generally enforced. Moreover, to obtain prompt as well as complete results, one may best be overparticular and thorough in outlining and enforcing measures for relief. These range themselves under five heads:

1. *Specific medication*, directed to recognizable conditions, as rheumatism, malaria or other microbic cause, and the empiric use of arsenic, the one remedy which uniformly yields good results.

2. *Rest* to the body, which is in extreme overaction, from whence a reaction falls upon the motor centers, interfering with sleep, etc.

3. *Nutritional repair*, necessitated by the many factors which unite in depreciating and devitalizing the tissues, plus the wear and tear from exaggerated muscular action.

4. *Reëducation of coördination*, a very important but little noticed item.

5. To prevent recurrence by anticipating the periodic return and enforcing suitable measures. Cases should return in spring and fall, September and February especially, to be put upon arsenic in ascending doses.

It is assumed that we desire to get the quickest and best results.

First, then, whenever possible, it is well to put the child to bed for a time, making use of adequate clothing to prevent exposure and permitting play with toys (not books) after a few days. The food should be of the plainest for a fortnight at least, and altogether omitting red meats. Nitrogenous compounds are ever unstable; these should be left out in all explosive conditions, and also to secure tranquillization of the excessive nervous discharges. Permit sweets only in moderation, using a diet mostly of milk, fruits, and vegetables. Have the child bathed freely in tepid water twice a day, better than once, getting it cooler and cooler. It is well to flush the spinal areas with cold water from the first after the warm application has been made,

and use sharp friction to the whole skin surface. If this be done with the dry salt towel a better surface glow is secured. A laxative every second or third day for the first week may be needed, to make sure of freedom from intestinal irritation or fecal toxins.

Children suffering from chorea are usually pallid and often found to be anemic and flabby. The excessive restlessness uses up both nervous energy and blood, hence arise unconscious fatigue and wasteful metabolism. For this the carbohydrates offer better supply than albuminoids, and our custom is to enforce the use of fats. Cod-liver oil was first used for rheumatic conditions and still stands preëminent as a recuperative agent in disorders of this nature. It is best given in capsule and often only once or twice a day. Iron is not often needed, especially when arsenic is employed for its specific action—whatever that may be. For the first fortnight, bathing twice daily, with vigorous salt towelings, is enough of tonic to the surface. After that employ massage to redistribute blood from depths to surface and also for its controlling power over nervous disquietude. For this effect it should be administered somewhat differently from the usual methods; slow, steady surface stroking should be followed by firm, quiet kneading, ending with passive movements of the limbs and overstretching like that used for spastic conditions. And in children a shorter seance is required—not more than half an hour.

As soon as the prodigality of movements comes under control greater liberty may be allowed both in diet and exercise. Then to be partly dressed and remain up and about the room for most of the day, resuming ordinary occupations, is admissible, not permitting any fatigue production, however, and, above all, no excitement or annoyance.

When the ataxia has been excessive, a most useful measure for restoring clean and accurate coördination is to reëducate the limbs and motor centers by teaching the use of accurate movements at word of command, systematic posings, and mild, free exercises. It is well to direct the action of the eye up, down, to right and left; the fundamental arm and leg attitudes, rising gradually to complex acts, as tossing and catching a ball or bean-bag. All this in regulated doses, and followed by bathing and rest. In all exercises of convalescents, regulated or free, a period of absolute rest should immediately follow.

Of medicines, not a very large variety warrant confidence. If any

trace of rheumatic pain show, it is best to be met by the salicylates, which children bear very well anyhow. We like the ammonium salicylate, and along with it ammonium bromid in liquor ammonii acetatis, or maybe elixir of calisaya in full doses for three or four days. Precede this with a laxative, and follow with the arsenic. Nothing is better than Fowler's solution, begun at three drops, thrice daily, increasing one drop a day (which just doubles itself on the tenth day), and continuing up until toxic symptoms are clearly manifested. Then stop for one day, and continue the daily dose just preceding the toxic signs for several days. If this prove too much, stop and begin at the three drops, and go up again. Keep up the arsenic until a week has passed without twitching. In severe cases, arsenic may best be given hypodermatically; moreover, some will receive it better thus than by the mouth. For this purpose, liquor potassii arsenitis may be made without the lavender. Arsenic thus enters the circulation without first passing through the liver, and the poisonous effects are not so readily produced. The arseniate of soda is recommended for this, using a five per cent. solution, commencing with three drops, gradually increasing till ten to fifteen drops are taken or toxic symptoms are produced.

In using Fowler's solution always write out the schedule of increments on a card, thus :

First day, 3, 3, 3,
 Second day, 3, 3, 4,
 Third day, 3, 4, 4,
 Fourth day, 4, 4, 4, etc.,

till about the tenth day. Each day the nurse may check off the figures, showing the exact progress. It is of value to write full directions, indicating possible complications and toxic symptoms.

Quinin has been claimed as a specific upon the theory of its central action, reinforcing inhibition. It has, not often but occasionally, done good service at our hands in chorea. The possibilities of malaria being at the bottom of the disorder must not be lost sight of, when, of course, we may expect results from its use. Moreover, quinin has a most happy effect upon spasmodic action, as in pertussis.

And, finally, chorea may pass into a habit-spasm, although that mimetic disorder arises in other ways. Habit-chorea, however it may come, is a close cousin to the real thing, and is benefited by much the

same treatment. Nevertheless, it is often a most intractable condition and requires firm moral means to check. Hypnotism or powerful suggestion or mild fright are all useful. Suggestion helps sensible children to tell them they can rid themselves of a foolish and entirely controllable state.

The steam-bath or hot pack, to secure sleep and eliminate toxins, has given admirable results in certain cases, particularly where the disorder had persisted in spite of rational treatment. This employed twice daily for four days, without other than diet treatment and laxatives, then followed by specific medicines, has yielded excellent results in difficult cases.

In cases which have had one or more previous attacks, note the months of onset, and induce them to return one month earlier than the attacks occurred before for treatment. Thus they can be practically aborted.

Habit Movements or Habit-chorea.—Among the conspicuous and not rare disturbances of motion are to be mentioned the habit movements, habit-spasms, or convulsive tics strongly resembling chorea but with special features of their own, and marked differences as to nature, causation, and curability.

These are tricks of movement, coördination of muscular acts, generally involving the face, shoulders, and sometimes legs, simulating purposes, accompanied occasionally by speech or vocal and other sounds. In the majority of cases they began as imitations or repetitions of acts, becoming fixed and exaggerated into habit, which are difficult to cure in proportion as they are matured, and occasionally persist throughout life.

Probably the commonest starting point is chorea minor, especially where the attention of the child has been drawn to some particular movement or act in another, and conscious or unconscious repetitions have been indulged in and then changed to another variety till a series is formed, which performance is repeated in succession. Any such trick should be promptly recognized by parents, and unqualifiedly condemned, nipping them in the bud ere they become an offense.

It is well to use a systematic nomenclature in dealing with this class of allied affections, which Osler says pass insensibly into one another "from a simple, habitual, conscious spasm of the facial muscles to complete coördinate movements with marked physical features, or to

habit phenomena purely psychic." The distinguishing factor in the entire group is the habit of repetition, whether of motion or idea, which, while influenced or controlled to some extent by the will, occurs in response to a sort of impulsion in the case of muscular movements, and in the case of imperative ideas as a sort of obsession.

1. Habit-spasms, or simple tic, are the common instances of spasmodic movements,—chiefly of the face-muscles and moderately under volitional control. The acts are repeated more positively and with far greater rapidity than those of chorea; they are more systematic, purposive, and limited in scope. There are cases of sudden contraction of certain muscles very like that produced by an electric shock; hence Henoch has called this electric chorea.

2. Convulsive tic, or Gilles de la Tourette's disease, exhibits, in addition to the ordinary motor disturbances of habit-spasm, imperative ideas and explosive, jerky shouts and ejaculations. Some of the words thus unintentionally uttered or flung out of the mouth are accidental reflections of what has been casually heard and yet received a degree of subconscious attention, either with a partly formed intention to use again, or as readily a full intention to never utter, as, for instances, obscene phrases, of which the patient may be unconscious or by which he is intensely mortified.

3. Complex coördinated tics (Noir from "Bourneville's Clinic"). There are tricks of this kind mentioned by many, several of them being strung together in a series, as a child when offered an object always blows upon it, smells it, and turns half away, or stooping down, lying on the floor, raising the hands above the head, etc.

4. Psychic tic, imperative ideas, the outgrowth from imperative movements, the idea fixed impelling a child to do certain things under similar circumstances, as the old trick of stepping on different paving stones without touching the cracks, to always go out of the way in passing certain objects, to cross the street at a certain place each time in passing, etc. So strong are these as to make the life of the sufferer a burden by the multiplicity of the meaningless procedures.

The **treatment** of these disorders is largely suggestive. Oftentimes hygienic measures are required, and many of the rational means outlined under the treatment of chorea will prove of value. Outside domination is generally required to aid the sufferer to rid himself of

the disorder. Partial hypnosis is most effective, prophetic statements as to when and how the recovery will occur (always indulged in with due caution to reinforce probability), and dominant commands at times often suffice. In spite of well-directed measures, many cases persist till death.

Hereditary or Huntingdon's chorea is a very rare malady, seldom appearing in children, but due to conditions chiefly hereditary, which arise from causes affecting the child in earliest developmental epochs. Several members of the same family are usually affected. The symptoms generally grow worse as age advances. The movements of hereditary chorea are "coarse and grimacing, and may be distributed over a large area of the body." They are partly controlled by volition (passive). In true chorea the movements are more localized. Huntingdon's chorea may be confounded with post-hemiplegic chorea or hemispasm. The reflexes, however, are not markedly altered; in the cerebral disorders they are exaggerated. Hysteria may simulate this but exhibits characteristic phenomena.

Hereditary chorea is incurable; life is not materially shortened, but there is a strong tendency toward dementia in its victims. Treatment is the same as for true chorea, and the severity of the symptoms can be much mitigated by rational measures.

Postparalytic or posthemiplegic chorea is a choreiform disorder strongly resembling chorea at times, but due to changes in the motor areas of the brain and described under cerebral palsies.

INSANITY AND DISTURBANCES OF THE MIND IN CHILDREN.

The subject of mental disorders occurring in children can only be treated, in a book of this size, in a general and comprehensive way. Systematic classification is of little avail, and this will be found in special works on the subject.

Mental disorders in children must of necessity be of a simple kind, since the intellectual faculties are not in them yet highly specialized. True insanity in children has been occasionally observed in the very young; even the more conspicuous kinds, as raving madness, have been noticed. It is important to bear in mind that these mental disturbances of children—while at times well defined, with sufficiently definite symptoms to warrant both classification and definite prognosis—

nevertheless change very much from time to time, and that which threatened to be serious may subside most surprisingly ; furthermore, the varieties may overlap considerably, rendering a clear-cut diagnosis difficult or impossible. The prognosis in most cases is to be very guarded and is usually good, provided the most favorable circumstances can be secured with wholesome environment and wise care.

The most important subjects for the pediatricist to study are the "Developmental Neuroses," arising, as the name implies, during periods of growth, and their later variegated forms resembling one or another of the recognized forms of insanity and hysteria.* Some of these pass readily away as growth proceeds ; others become confirmed or change into serious mental states.

We will give a brief review of the different forms of insanity occurring in children, as outlined by Mills :

Transitory Psychoses.—Under this head will be considered delirium arising from special causes, some children being more susceptible than others to slight rises of temperature. Some children have highly developed imaginations, and these excited by parents and others produce temporary disturbances of mind which are grave sources of peril and readily productive of permanent states.

Night terror (pavor nocturnus) is a form of temporary mental disturbance. This transitory psychosis usually takes the form of excited or agitated melancholia, giving evidence of great mental suffering and depression, vague and indescribable.

Mania is the form of insanity most frequently occurring in childhood. It appears in the form of an active delirium with great motor excitability, emotional expansions and hallucinations, and at times delusions in children old enough to have imaginative ideas. Mania may be recovered from or become permanent.

Melancholia seldom begins before five or six years of age. It usually merges into the monomanias and other disturbed mental states. The varieties seen in children are simple melancholias, the excited or agitated, and the hypochondriac. Depressing surroundings and deprivations sometimes drive children to suicide.

Circular or alternating insanity is a form in which there is, first, exaltation or mania, followed by mental depression, and then

* Chapter on Developmental omitted for lack of space.

lucid periods, and later exaltation, again to be followed by brief melancholy, the cycle coming and going with variations.

Choreic insanity is a form of mental disturbance following upon chorea, which is a variety so severe as to exhaust the patient, interfering with sleep and health. This is sometimes of a very violent character with great emotional exaltation.

Hysteric Insanity.—In childhood, acute mania and hysteric mania run together into a picture most difficult to differentiate. If the characteristic symptoms of hysteria be present, which are ecstasy, catalepsy, trance, aphonia and fantastic emotions, or false palsies, there will be little difficulty in distinguishing between hysteric conditions and insanity. Extraordinary occurrences which have given rise to the suspicion of visitation by spirits, by rappings, cat-calls, rooms being set on fire, and such like things, are very likely to be the result of this form of disorder among children, girls especially. Frequently there arises in institutions and schools imitative psychoses, occurring in epidemics; there are then ordinarily found among the symptoms disturbances of speech, hallucinations of sight and sound, and false palsies.

Cataleptic insanity, or catatonia, is very rare among children. This form begins usually as a mania, followed by melancholy, with stupor, with instances of dramatic exhibitions following.

Epileptic insanity is not rare in children of well-marked imbecile or idiotic characteristics and who are the victims of epilepsy. Sometimes attacks of insanity or mania occur among children who suffer from epilepsy and in the interval between the attacks are, apparently, mentally quite well. The mania may occur just before or after the epileptic paroxysm, or replace it. It should not be a source of surprise if epileptic children occasionally show marked perversion of character and manner.

Paranoia, or primary delusional insanity, is a chronic form of mental disease, or, in certain instances, mere mental instability accompanied by insistent ideas, exaggerated self-consciousness and perversity of character, and morbid impulse. Paranoia is rare under the age of puberty, but to the trained observer certain marked peculiarities and eccentricities will lead him to predict the development later, in such sufferers, of delusional insanity. The symptoms are gross peculiarities in dress and conversation, obtrusive ideas and egoisms,

tendencies to dreaming states, and a bustling attempt at remarkable plans leading to nothing, unduly emphasized concepts or misconcepts, with alternate periods of depression and emotional excitements.

Moral insanity and **moral imbecility** are terms which are needed to describe those vicious habits and tendencies constantly showing themselves in certain children who are otherwise apparently wholesome-minded. Instinctive perversions and morbid impulses flow out of some inherited constitutional conditions which are at the root of monomania and paranoia. To rightly estimate such states as these, it is necessary to understand fully such words as "concepts," which may be morbid or imperative; also "imperative movements," "insistent ideas," or unhealthy propensities. The concept is a definite or isolated thought which may become an impression and tyrannize the mind; and imperative movement, or action, is an unhealthy impulse, the result of an imperative conception. The term "insistent idea" is used to describe a habit of thought resulting from the repetition and multiplication of morbid conceptions, which may, after a time, interfere with and dominate the acts of volition and intellect.

Morbid fears, or phobias, are conditions occurring on the borderland betwixt mental health and disease, which may be transient or more or less permanent, and generally have to do with hereditary impressions. These may occur in a mild form and persist throughout a moderately useful life.

Paretic dementia is essentially a disease of adult life, but in rare instances is seen in children.

IDIOCY AND IMBECILITY.

It is important to discuss also the subject of idiocy and imbecility in a work of this character, to enable the general practitioner, who usually takes small pains to investigate the subject, to recognize the condition and to early put the patient in the position to secure relief, repair, or at least mitigation. It must not be assumed that, because these conditions as usually seen are practically incurable, they need little or no attention except at the hands of specialists. Incalculable relief can be afforded to many of the victims of the higher grades of imbecility if they receive judicious care in their earliest forma-

tive periods. This is important for many reasons, chiefly for the families of such, who will suffer far less misery and discomfort if they are put on their guard and learn how to manage the sufferers in the right way. They should learn to know the limitations and not to expect too much, nor to inflict punishments upon backward children for faults due solely to their inability to form wholesome mental concepts of duties and responsibilities. The imbecile, moreover, exhibits well-marked characteristics, a proper appreciation of which will enable the parents to educate them to become endurable members of the family or of the community. Perhaps the most important consideration is the question of marriage and reproduction, to prevent which every effort should be made and authority exercised. It is of the utmost insistence that children of obvious mental defects, even of a relatively mild character, should be removed from their homes and placed in the keeping and under the guidance of those who are competent to assume this responsibility. The machinery of an ordinary household is altogether unfitted to bear the additional burden of these strange and uncertain factors.

The reason for this bears equally upon the component members of the household on the one hand and the defective child on the other, who is certain to be made worse by the overfond solicitude of a parent or the impatience or harshness which is more liable to govern the actions of those who must assume the grievous burden, not knowing how it should be borne nor how the poor creature should be managed.

Imbecility or feeble-mindedness or mere backwardness are terms used to denote the lesser degrees of mental deficiency, which run through a very wide, varying scale. Mere slowness to acquire knowledge is of far less importance than disabilities of judgment or lack of balance in the reasoning faculties necessary in the ordinary affairs of life. Where, as frequently happens, there is conjoined to manifest mental discrepancies yet fairly large capacities in certain lines, the difficulties of estimation are even greater. This produces a state which the world at large is loath to regard as unfit for responsibility and yet none the less requires the exercise of safeguards and control. The inferiority of such an individual is rarely detected in the family circle, but once the child is thrown into competition with others in the outer world, its peculiarities become more or less conspicuous.

Under these circumstances the feeble-witted person becomes either the butt or the tolerated one, is treated as a creature apart, and fails to grow in mind and character. The imbecile can not appreciate the reason for his lack of success, and is incapable of developing the higher moral ideas or faculties, and it is from these that the mischief-makers and criminals develop, and those in whom the ideas of right and wrong have never been clearly conceived or differentiated. The idiot is a much simpler problem than the imbecile. Being little better than an animal with merely gross resemblances to a human being, there can be no question that he is unfit to be retained in the family circle, where he absolutely has no place, despite all the well-intentioned sentiment or affection which may desire it. The idiot is a person who lacks capacity to form the ordinary mental concepts or judgments, and whose brain is incapable of receiving and interpreting impressions from the outer world. The distinction between the idiot and the imbecile is one chiefly of degree or anatomic deficiency, although in the higher grades of imbeciles the structural defect is small. For purposes of systematic presentation we can not do better than accept the classification of Sachs, as follows:

- I. HEREDITARY IDIOCY. { (a) Congenital.
(b) Developmental.
- II. ACQUIRED IDIOCY. { After traumatic injuries (including birth-idiocies).
After convulsions.
After infectious diseases.
- III. MYXEDEMATOUS IDIOCY.

Congenital idiocy is the result of brain deficiencies from birth, which may or may not become apparent for a long time afterward. (See chapter on Cerebral Palsies.) Developmental idiocy is that variety which becomes apparent at certain well-marked periods of life, as dentition and puberty, but which occurs only in persons of vulnerable or unstable equilibrium. The term acquired idiocy is used to designate that large class of cases produced by a host of diseases and accidents, such as palsies, convulsions from whatsoever cause, infectious disease, traumatism, meningitis, etc.

The symptoms of the various kinds of mental defects in children would occupy too large a space to enumerate thoroughly. A complete idiot is a human being not only bereft of intellectual qualities, but

without even the intelligence as ordinarily seen in animals. These symptoms run through a very considerable scale, from helpless, speechless idiocy up to a type of being called "imbecile." An imbecile is a human being possessed of the ordinary intellectual faculties, but of a very low order. This definition is obviously lacking in definiteness, but it is scarcely possible to be exact. Beyond the imbecile class we reckon feeble-minded and backward children, which brings us up to a type merged imperceptibly into the average members of society. The symptoms of the idiot are altogether apparent: there is usually a general restlessness of movement and awkwardness, a ready excitability and irritability of temper, and peculiarity of facial expression. The question of diagnosis is usually whether the mental deficiency is reparable, capable of mitigation or cure, or hopeless. Among imbeciles of the higher grades much can be accomplished by careful educational measures and firm, gentle control.

Myxedematous idiots and cretins, though extremely rare in America, are interesting, chiefly because of the possibilities of cure which have been opened up in recent years by the one specific agency about which many startling claims are made—namely, feeding with thyroid extract. The pulverized gland is now used extensively, and with some brilliant results both upon the mind and body. The dose is from $\frac{1}{2}$ of a grain to a grain, three times a day, for children two years old, up to two or three or even five grains for older children. This sometimes produces untoward effects, which are so obvious and varied that it is scarcely worth while to discuss them here.

Treatment of Insanity and Mental Disorders of Childhood.

—In order to prevent mental enfeeblement in the young we must first defend them from degenerating influences of a kind competent to leave a permanent impression upon the individual or the offspring. Next, opportunity must be afforded for development of both body and mind, which are interdependent. Again, protection must be afforded against accidental injury by trauma or poisons.

It is rare to meet a mother capable of rightly training a child not altogether wise. Some, happily, are admirably gifted in this respect, and if the mother is capable of being, or will submit herself to be, carefully instructed how such a case shall be managed, sometimes the very best results come from home care. It has been our experience to see some excellent instances of these mothers, and we are inclined

to believe that this possibility may be amplified by educating willing mothers to this duty. Again, we have found immediate relatives who both could and would undertake this care and bring about excellent results. As a rule, the mother is so hampered by emotional considerations that her judgment is not good in respect to her own child. Then the problem arises, To whom shall it be committed? It has been our custom, and we think from it some excellent results have come, to always search about among the home possibilities of such a case, and not seldom there has been found some good maiden woman or widowed aunt or childless person, who could be taught to do what the same child's own mother might be able to do for some other woman's child. We have before us always the admirable example of the insane colonies of Europe, where excellent results come from treatment in private houses, and whenever this can be accomplished it is better to do so.

In questioning, examining, or otherwise dealing with the child as a neurotic patient, success in arriving at right conclusions depends as much on the demeanor and conduct of the physician as on his knowledge. With the adult this may possibly not be true, but in respect to the less differentiated mental organization of the child the proposition will hold. Skill born of much experience is needed to win the confidence of the child, and to this must be added tact and gentleness. Here again gentleness should not lack firmness and decision. If the patient be one whose disposition or morals are obviously disordered, it is of double importance to approach the problem aright, either to learn essential facts or to select remedies.

Medicines will often be quite needless, but moral control and tactful domination must be ever forthcoming. The physician should succeed in impressing his personality upon the patient. He must represent embodied power, helpfulness, and justice. In some instances he may be of a loving manner, pleading with the obstinate but sensitive, errant nature. More often he needs to pose as a kindly yet overmastering being, to whom confession and obedience must be yielded soon or late. Again, overvoluble, highly graphic confessions of the patient are to be discounted. Always obedience must be exacted, but tempered by due consideration of immediate necessities and no more. Gradually simple but systematic measures may be given shape and pushed steadily to an end.

Much tactful shifting in the position of the questioner is often demanded, and seemingly unessential procedures are at times advisable ; patience, persistence, and firmness always.

The heedless examiner will often give to the shrewd observation of the hysteric or insane child leading points on which to fashion its symptom-groups by his idle words and leakage of thought while " thinking aloud," and he may be thus misled afar. Moreover, the distinction between these closely resembling conditions is not seldom a purely relative matter, to be decided by the personal factor of the observer or the social or individual standard of the patient.

Again, hysteria and organic brain diseases may coexist, not often in the child, it is true, but will prove most puzzling.

Moral perversions are hard to distinguish from merely evil and vicious tendencies, which are acquired by a stupid, impressionable subject.

The moral imbecile is inherently bad and practically incurable. He is an instinctive liar and thief, cunning and skilful in mischief-making, and if in other ways seemingly competent, yet unspeakably provoking to the teacher or parent. To know how to deal best with such is generally conditional upon a clear decision as to whether one has to do with an ineradicable vice or disease (here probably synonymous), or a possibly removable disorder. The main thing is, not to attempt for the individual too elaborate a plan of improvement, and when he is under favorable surroundings to exercise infinite patience and use abundant time. He is to be made to know that while not fully trusted or believed, the utmost encouragement shall be enjoyed so soon as evidence of improvement is shown.

Along with obviously wicked acts may often coexist evidences of disease process, as convulsions. It is often most difficult to determine surely whether these are epileptic or hysteric. These may appear in combination, too,—hysteric attacks in an epileptic subject, a blending to which there is no clear key.

Typical, clear-cut cases of neurotic maladies are none too common, and ordinarily it is only by the after-fruits of treatment that they are determined. A large familiarity with hysteric states increases one's respect for the difficulties of differentiation.

Hysteria must have some sort of audience always, and wherever vanity can be detected or surmised, it will help to determine the

nature of the attack. The instinct of the physician is also an aid, but must not be masked by prejudice.

In the management and moral training of children of hysteric or maniacal tendencies, the first step to be gained by physician or caretaker is to win their confidence. The best method to pursue is to show and preserve a frank, quiet, yet persistently friendly demeanor. In first interviews it is wise with all children to avoid a too direct and impulsive approach. Childish concepts come slowly; conclusions which are being formed with no great promptitude should not be hurried. Overprecipitancy offends, and the result is negative. Very much the same courteous, straightforward methods win a child which prevail with the elder.

It is well to efface, as nearly as possible, the differences of age and position between the patient and physician. Assume both to be on the same plane, the one simply taking the initiative. It is inscrutable to us how those people who talk baby-talk (as it is ludicrously mis-called) to children ever succeed in rendering themselves otherwise than most offensive.

Knowledge of the mental processes of the patient one must have, and accurate information only comes through intelligent questioning. We have repeatedly been able to secure the attention and frank answers of a child which our assistants had utterly failed to get, by conveying the impression that we were just such a person as themselves, who asked straightforward questions and fully intended to obtain equally candid replies.

And if this be true of the medical man in rare interviews, how much more needful it is that those who watch and direct the daily progress of the child shall proceed in the same frank, honest fashion ever.

Punishment is sometimes needed; sharp, corporeal punishment, too. Some children of low tone or vicious hysteroid character are amenable to no other argument. Who shall administer this, and when, is of gravest importance to determine, and only harm comes of lack of judgment here. More often gentle domination or kindly encouragement will suffice. A jocose, bantering tone also offends. Begin by questioning the attendant, parent, or nurse, thus allowing the child to take bearings and see that you are not an oger; then proceed to gently draw out the childish thoughts by speaking on

perfectly comprehensive subjects first, and on others indirectly, and finally directly questioning.

The children of pauper and criminal classes need most careful watching and unusual training in the fundamental principles of morality. Instead of this they usually get overmuch liberty and far too much religious teaching. The training in religious thought and observances has a tendency to foster an exaggerated emotion, which is in some ways closely allied to mental and sexual excitement. Moral instruction should always precede the religious. Moral insanity can only be treated in special institutions.

HYDROCEPHALUS.

Clinically, hydrocephalus is the accumulation of an excessive amount of serous cerebrospinal fluid within the cranium, and is divided into external hydrocephalus, where the collection is beneath the dura and outside of the brain, and internal, where the ventricles are overdistended, and these two conditions may coexist. The distinction is further made between acute and chronic hydrocephalus. The effusion is either slow and passive or rapid and due to irritation. The acute form is rare. Some form of hydrocephalus accompanies all the varieties of meningitis, especially the tubercular; but there is a particular disease described by Quincke, called meningitis serosa, and considered a purely idiopathic serous meningeal inflammation. The cause of this may be due to injury and the sequel of various febrile diseases and certain other agencies which profoundly disturb the circulation, as the overuse of alcohol in the parents.

The **symptoms** of acute hydrocephalus are very similar to those of an acute meningitis,—retraction of the head, rigidity, nausea, coma, delirium, sometimes fever up to 103° , sluggish pupillary reaction with inequalities, and optic neuritis. In mild cases these phenomena soon subside and full recovery follows. This is what frequently gives rise to the cerebral symptoms which accompany the acute febrile diseases. At other times the disease progresses to a fatal issue.

Chronic hydrocephalus may begin as a congenital imperfection of the brain due to improper development. This may be confined to one hemisphere, the whole of which may become a huge cyst com-

municating with the ventricles. The most important form of hydrocephalus, however, is the congenital. Here, during intra-uterine life, the ventricles become distended with a large amount of fluid which so increases the size of the head as to cause an impediment or a bar to a normal parturition. Or, the child surviving, the fluid may go on increasing for days, or to the end of a pretty long life. Such a child may be born of apparently perfectly healthy parents, and there may be more than one like this in a family. The actual cause is seldom known, but the various degenerative conditions in the parents are accredited with causal agency, and no doubt are more or less operative. Profoundly disturbing causes acting upon the mother are probably competent to produce a condition of this kind, but only where other causes coexist in one or both parents, as syphilis, tuberculosis, and, above all, alcoholism. Mild congenital hydrocephalus is probably quite common, and recovery is oftentimes so complete that mental development is little or not at all interfered with. It is true that the growth of the brain, under the grave disadvantages of this internal hydraulic pressure, met by the resistance of the cranial walls, is usually so interfered with as to produce varying degrees of imbecility. The brain itself may become distorted and reduced to thin sheets here and there, the white matter yielding more readily than the gray, and yet it is astonishing how fair a degree of integrity of functional activity it may retain.

The **diagnosis** of different forms of hydrocephalus is very difficult and not of much practical importance. If the child be of good vigor it may survive and acquire a fair degree of intelligence; if not, it will speedily succumb to very slight disturbances. Regular measurements will enable the physician to estimate the increase in the fluid and thus determine the course of the disease.

Treatment is by no means hopeful. In the milder cases, iodids and tonics may do some good along with mercurials and diuretics. The tapping of the ventricles has been advocated and is a safe enough procedure, but the accumulation of fluid is so rapid that there is little to encourage the use of this measure.

Lumbar puncture is a simple operation capable of small harm. We have reported three cases markedly benefited by lumbar puncture, one permanently, and in two the acute overwhelming phenomena of hydrocephalus were satisfactorily mitigated.

EXOPHTHALMIC GOITER.

This disease, known also as Graves's disease by the English and as Basedow's disease by the Germans, is confined chiefly to adults, but begins occasionally in childhood. Moreover, it is necessary to distinguish between this and an enlargement of the thyroid gland, and also certain disturbances in the cardiac rhythm seen in girls at or near puberty. Again, there are other instances of tachycardia, usually transient but occasionally most persistent and confusing, as in the case of a boy, a patient of one of us, which baffled the skill of many physicians, finally getting well of itself in spite of overmuch medication. The most frequent cause is excessive emotional excitement, but this is usually superadded to some other exhausting disturbance, and the whole upon a basis of neurotic heredity. The thyroid gland is accused of being responsible as the cause by an irregular or deficient action, producing a toxin affecting vascular innervation.

The **symptoms** of exophthalmic goiter are rather numerous. The three classical symptoms are: Irregular and overmuch action of the heart (tachycardia), enlargement of the thyroid gland, and protrusion of the eyes. There are certain accessory symptoms, the most important of which are connected with a disturbance of vasomotor control. The skin is usually much relaxed, and there is almost constant sweating, sometimes excessive, which may be localized or general. There is often, too, an apparently causeless diarrhea, apparently independent of intestinal disturbance, most difficult to control. The kidneys frequently suffer in the same way, as shown by albuminuria and occasional hematuria. In some instances sugar appears in the urine also. There is occasionally disturbance of respiration, and attacks resembling asthma occur.

The most important symptom is the disturbance of the action of the heart, which can scarcely be called organic, although when unduly prolonged it may give rise to dilatation or even hypertrophy. The sounds of the heart are not, as a rule, altered, but may be unusually loud, and musical murmurs at the base have been described. The pulse oftentimes runs very high, especially under excess of excitement or slight exertion. Hemorrhages, as from the nose, are not infrequent, also into the alimentary tract. One of us has paid a good deal of attention to this disease, especially in adults, and several cases have been

observed, especially in young girls, which seemed to be instances of this disorder but exceedingly mild. In some of these the tachycardia was absent or only occasionally present, but the enlargement of the thyroid, exophthalmos, the leaking of the skin, attacks of dyspnea and tremor, especially a vibratile quality of the voice, were all observed. The enlargement of the thyroid gland is usually present, but the other symptoms may exist without it. It is likely to follow the development of the tachycardia. The bronchocele is usually of both sides, but one side is usually bigger than the other. The exophthalmos is less constantly present than the tachycardia or goiter, and while usually of both eyes, may be unilateral or more marked on one side than the other. The cause of this is probably interference with the venous currents along with arterial congestion. It disappears almost immediately after death. Vision is rarely interfered with. The pupils may be unequal but of normal reaction. Von Graefe's symptom, long regarded as of importance (a failure of the upper lid to follow promptly the downward movement of the eye), is by no means constantly present, and may occur in connection with other neuroses. There are often, in addition to these phenomena, evidences of mental disturbance or loss of equilibrium, commonly present at some stage of the disease. Patients with Graves's disease are usually irritable and fretful; but this is not to be wondered at when one considers how annoying it is, when feeling in other ways pretty well, to be constantly limited in normal energies, to find oneself unable to sustain any ordinary activity without prompt distress. Headache is a not uncommon feature.

The morbid anatomy of Graves's disease is far from being understood, and the theories regarding pathology are still most conflicting. Views as to the toxic origin of the disease based upon deficient action of the thyroid gland, obtain rather generally. Graves's disease runs a chronic course for months or many years, but the prognosis, in our opinion, is good. We have seen a number of cases become most comfortable, and several very severe ones become entirely cured.

Treatment.—There is no reason to believe that we have found any specific for this disease. Certainly our own experience in the use of thyroid extract has proved disappointing. A removal of some part of the enlarged thyroid is a much more rational measure, and yet in most instances unnecessary. Our opinion is that this is a most manageable

disorder, and in fully half, if not more, of the cases entirely curable. Attention should be directed first to the vascular erethism by absolute rest in bed, at least for a few weeks, with graduated return to activities; uniformity in diet, at first milk or its equivalent; careful attention to digestion and elimination; and agents which will tranquillize and control cardiac action. Small repeated doses of hyoscin hydrobromate have given us the best results, along with phosphate of soda, and from time to time the use of the direct cardiac tonics, of which digitalis is the most satisfactory and seems to disturb least given by the rectum. For the sweating (a distressing symptom), picrotoxin acts admirably, from $\frac{1}{30}$ to $\frac{1}{100}$ of a grain, as often as may be needed to produce an effect. Baths and frictions are important, especially salt, as sea-water. As a direct application to the skin, aromatic vinegar is pleasant and effective. Cold to the region of the heart will control tachycardia. For the diarrhea, opiates, the aromatic sulphuric acid, and cannabis indica, with caution; sometimes small repeated doses of podophyllin act even better than astringents. Belladonna or hyoscin are useful in most stages of the disorder, as well as alkalis, uricacidemia being a pretty common collateral factor. The main reliance is upon general hygienic measures. Other glandular extracts are praised for their effects on this disease, notably that of the adrenals.

RAYNAUD'S DISEASE.

Raynaud's disease, called also symmetrical gangrene, is a trophoneurosis occurring rarely, but the sufferers are quite as often children as adults. This disease consists of a localized ischemia or asphyxia, symmetrically distributed. The parts affected are pale and wax-like in appearance, greatly increased by variations in temperature, as when dipped into cold water. The local temperature is lowered; and if the part is pricked, little or no blood comes from the puncture. The regions affected are the fingers and toes, the nose, and sometimes the buttocks and calves. The disease may remain slight and the parts recover their tone. In other instances the disorder progresses and gangrene results, producing a destruction more or less extensive.

The **symptoms** of Raynaud's disease have been noted in connection with neuritis and myelitis, locomotor ataxia, and syringomyelia.

The **prognosis** as to life is fair. If the disease destroys tissue extensively the general health suffers.

Treatment is mainly the raising of the plane of the patient's health and a prompt removal of the gangrenous parts.

MYXEDEMA.

Myxedema is a trophoneurosis allied to cachexia strumipriva and sporadic cretinism, which has obtained much attention of late because of the brilliant results of thyroid feeding, relieving what had always been considered an incurable and deplorable state. The **cause** of this is chiefly a deficient action of the thyroid gland. The **symptoms** of the congenital form are: A hard and glossy skin, stunted stature, a mental state of more or less complete idiocy or imbecility, with lips and tongue thick and large. The general appearance of a child so affected is characteristically loathsome. Happily, immense improvement is to be expected from a gradual use of feeding with thyroid extract, $\frac{1}{2}$ to one grain once or twice a day, cautiously increased until three to five grains twice a day may be taken. How large an improvement can be had our experiences in the matter do not as yet enable us to judge.

MIGRAINE.

Migraine, megrim, hemicrania, or sick headache, is an exceedingly troublesome neurosis of young people, and occurs frequently in children. It is characterized by occasional attacks of headache, often of one side, with which are associated nausea or vomiting, and peculiar visual disturbances, vertigo, and sometimes alterations of sensibility.

Causes.—Migraine is usually inherited, either in its own form or as an outbreak of a tendency to neuroses, among which epilepsy and hysteria are prominent. The disease usually begins early in life, most cases betwixt twenty and thirty, but some between the fifth and the tenth years, and more frequently in the female sex. Exciting causes are emotional disturbances, worry, fatigue, and disorders of digestion.

The predisposing causes of migraine are overwork, anemia, and general debility, which latter may be primary or be the sequel of some constitutional disease, not infrequently measles.

Symptoms.—The attack may come on rather slowly or quite suddenly, by a physical depression more or less obvious, pallor, chilliness, or disturbance of sight; then comes the head-pain, gradually increasing, for a few hours only or for a whole day. Vomiting or nausea usually accompanies the headache, but this may also be absent; or the nausea may be present and the headache absent—this especially in atypical attacks. Irregularities in the train of symptoms are more likely to be seen in the younger children, increasing in severity and completeness of the clinical picture as puberty approaches, after which time it usually persists until early middle life, when, happily, it not seldom disappears. The most characteristic phenomena are the unilateral headache, the sudden and extensive pallor, and the visual symptoms, often transient hemianopsia or hallucinations of sight. The nausea and vomiting are very like that due to cerebral irritation, and sometimes marks the culmination of the attack, followed by relief, and sometimes, again, it is not; but the pain and the vomiting may continue uncontrollable until the sufferer longs for death. The most interesting symptom is the visual disturbance, coming on sometimes at the very beginning, or persisting throughout the attack. This may appear as flashes of lightning for the first symptom, startling the patient. Others see bright zigzag lines, balls of fire, or figures of different shapes, the same sometimes recurring in subsequent attacks; others suffer more or less loss of sight, sometimes complete blindness or intense photophobia. The vasomotor phenomena are often prominent, usually pallor of the surface and coldness of the extremities, or the surface may be extremely flushed, and these may alternate in the same attack. When the explosion has spent itself there follows a considerable exhaustion as a rule, yet in other cases the patient feels storm-swept and relieved. There are many things in the attack which resemble the explosion of an epileptic paroxysm; but unlike the latter, which tends to get worse, migraine is usually outgrown and the sufferer has not the marks of a degenerate. The attacks are apt to recur with more or less regular periodicity.

Pathology.—The pathology of migraine is not known. It is, however, a cerebral affection, closely allied to a sensory epilepsy. There is every reason to believe that changes in the blood supply of the brain or its coverings are primarily responsible for the symptoms of migraine, and that the sympathetic nervous system is largely

involved. In addition to the view of its vasomotor origin some observers argue that there must be an inherent alteration of the nerve-cells of the brain. It is a curious fact that, whereas, in a person subject to migraine, changes in the vasomotor apparatus are capable of producing this nerve-storm, yet, in one without this tendency no such effect is produced. The resemblance betwixt migraine and epilepsy is so close that they may represent different degrees of affection of the cortical structure.

Treatment.—For the treatment of the attack very little can usually be done that is at all satisfactory. The stomach usually empties itself, and it is difficult to administer medicines which shall be retained by the stomach. Hypodermatically many drugs can be given which relieve; of these, small doses of atropin, hyoscyamin, or hyoscin hydrobromate, from $\frac{1}{300}$ to $\frac{1}{150}$ grain are useful. The nitrites have, in our experience, given satisfaction; nitroglycerin, $\frac{1}{300}$ to $\frac{1}{100}$ grain, along with hyoscin hydrobromate, has afforded in our hands much relief. If the stomach will retain, a host of remedies may be tried, some one or few of which may be found to relieve the individual case.

One of the best remedies is a little black coffee, without sugar or milk. Elixirs and syrupy things are liable to disturb digestion, already imperiled. Powders or plain solutions of the coal-tar derivatives suit some people; and a mixture of acetanilid, three grains; caffein, one grain; codein, $\frac{1}{8}$ grain; bicarbonate of soda, five grains, repeated every hour, is beneficial in some cases. Nitroglycerin or the hyoscin salts may, one or both, be given with this, and if the heart be quite weak, three or five drops of tincture of strophanthus; aconite is too depressing. In some cases a little alcohol is of use—a teaspoonful or two of brandy; this is not to be encouraged. Aromatic ammonia relieves some, especially if the stomach be over-acid. It is best to avoid strong-tasted things.

The constitutional treatment of sufferers from migraine must receive careful attention. Examination of the eyes, and proper correction of refraction errors, may happily relieve in some cases.

NEURITIS.

It is only recently that the subject of inflammation of the nerves has begun to be recognized or understood, yet the importance is very great.

MULTIPLE NEURITIS.

Multiple or polyneuritis is a term used to describe an acute inflammatory disease of the peripheral nerves and nerve-trunks, characterized by pain, anesthesia, paresthesia, paresis, and muscular atrophy.

Causes.—Multiple neuritis is relatively infrequent in children, since the causes leading to it are much more common in adult life. The common causes for multiple neuritis are poisons of various sorts which exhibit a selective tendency to affect the peripheral nerves. Perhaps the commonest of these, affecting children, are the toxemias, due to the ravages of micro-organisms of the infectious diseases, tubercle, and the like; this may also be due to sepsis which follows in the wake of injuries of many sorts. The malarial poison, due as it is to a specific organism, *plasmodium malariae*, has been recognized as a cause in a number of instances. These cases are sometimes mistaken for poliomyelitis, but are usually associated with intermittent fever, during which the disease undergoes remissions. Examination of the blood and spleen will reveal the cause, and quinin produces a relatively swift recovery. The infectious diseases commonly give rise to forms of peripheral neuritis; especially is this noticeable since our recent visitations of epidemic influenza. Diphtheria introduces the most conspicuous and troublesome cases, but differs from the other forms of multiple neuritis in the order in which the various parts become affected. Tuberculosis produces a certain number of cases, typhoid fever, smallpox, and especially syphilis,—but the latter causes obtain but rarely in children. Rheumatism is said to account for a certain number of instances; certainly in this disease the course of the nerve-trunks is frequently tender on deep pressure. Exposure to cold is an occasional cause, and excessive cold bathing has been known to produce neuritis. The metallic poisons are powerful factors for harm of this sort. Arsenic has caused a number of cases which have been carefully recorded; so, indeed, has lead. Mercury, carbonic oxid, and phosphorus have in rare instances produced a neuritis.

Alcoholic neuritis, of course, is not a common form occurring in children, nevertheless, among depraved families the use of alcohol is more encouraged in the young than might be supposed, affecting not only the peripheral nerves, but producing destructive changes in the liver, kidneys, and brain. Moreover, the appetite for alcohol in

children is sometimes not wanting. Injuries of nerves by fracture, wounds, blows, and direct pressure are followed occasionally by neuritis.

Morbid Anatomy.—In neuritis the changes are chiefly interstitial or parenchymatous, the perineurium usually escaping and the damage is confined to the peripheral nerves. In some instances the nerve is swollen, infiltrated, and its sheath hyperemic, of a red color and covered with minute hemorrhages. Sometimes the muscular tissue is involved, the fibers being smaller and paler, the changes there being both parenchymatous and interstitial. One of the most striking peculiarities of the phenomena of multiple neuritis is the fact that the toxins select the peripheral nerves and allow the spinal centers to escape.

The resistance of the more remote nerve-fibers appears to be lessened the farther away it is from the mother cell.

Symptoms.—The first symptom of multiple neuritis resembles an acute infectious disease. There is usually a chill, pains in the back and limbs or joints, simulating acute rheumatism, rapid rise of temperature, 103° to 104° , headache, loss of appetite, coated tongue, constipation; locally, pain, numbness, and tenderness. "The most characteristic feature of multiple neuritis is the association of motor paralysis with sensory paralysis—the distribution of each harmonizing with the other and showing very definite anatomic limits. The paralysis is of the flaccid order, leading at an early date to atrophy of the muscles, and the electric conditions are so altered that we may find almost every possible form of the reaction of degeneration, from a mere loss of faradic irritability to an absolute lack of galvanic response on the part of the nerves and muscles. The distribution of the paralysis is, as a rule, entirely symmetric, and may affect either the upper or lower, or all four, extremities; it may involve every part of all the extremities, and is the one affection which, perhaps more frequently than any other, leads to a complete paralysis of every limb of the body" (Sachs).

The characteristic phenomena of the disease are wrist-drop and foot-drop, due to the greater disturbance of the extensor muscles. Sensory symptoms accompany the paralysis, and where pain continues to persist in the muscles and along the nerve-tracks the diagnosis points more to multiple neuritis than to a central trouble. Absence of pain

does not impair the diagnosis of multiple neuritis,—motor and sensory paralysis is more slowly developed than in central affections, and there is more likely to be premonitory paresthesia. Sensory impairment is pretty equally distributed; at first there may be hyperesthesia. Later, pain may continue, and finally the sense of pain be lost along with the muscular and temperature sense. Tremor and incoördination are frequently associated in neuritis with the loss of sensation and power. Station may be imperfect, the sway excessive, or total inability to stand if the eyes are closed. The reflexes in the affected limbs are diminished or absent, especially the knee-jerk. The parts affected first are the ends of the extremities, and a weakness very early attacks the extensors of the toes, making it difficult for the patient to extend the foot in walking. The muscles supplied by the anterior tibial nerves are the most frequently affected in multiple neuritis, as well as in poliomyelitis, and in the arm the muscles supplied by the musculospiral nerve. The nerves supplying the muscles of the trunk are very rarely affected. The sensory changes are about equally distributed. Pain and paralysis are the distinguishing symptoms of multiple neuritis, but occasionally the one or the other is absent, or, in the case of pain, may have been transient. Electric reactions are extremely varied, both in character and degree. An important point is the early atrophy, also the absence of disturbances of the bladder and rectum. Glossy skin and edema, common in diseases of the peripheral nerves, are present in many cases and the peculiar tapering of the fingers. The course of multiple neuritis varies with the intensity of the cause, the symptoms, as a rule, increasing during the first five or six weeks, then diminishing. Both sensory and motor symptoms increase together, and then the sensory symptoms rapidly lessen, the motor phenomena more slowly; this last is due to the atrophy of the muscles and consequent contractures. As the severity of the symptoms subsides, even in the worst cases, recovery is usually steady and complete.

Diagnosis.—The characteristic feature of disease of the peripheral nerves is the close association of sensory with motor phenomena, indicating an involvement of the same nerve-areas. Also there is usually not only subjective sensations of pain, but tenderness along the affected nerve-tracks. In poliomyelitis the onset and course is more abrupt and violent, and the central nervous system shows wider

evidence of disease, and the paralyses are likely to be more one-sided ; in neuritis, more symmetric. In poliomyelitis there is rarely much tenderness along the nerve-tracks ; as a rule, the pains are vague but liable to be very severe in the early course of the disease. The electric reactions are very similar. Moreover, the two disorders may coexist. At all times the differential diagnosis between these two is difficult. The most important point is to recognize the special cause of the neuritis. In America, Sachs tells us, the most frequent cause will be found in a preceding acute infection—either by poisoning or by the toxic principles produced in the acute infectious fevers ; next in frequency is malaria, and, lastly, tubercular, syphilitic, alcoholic, metallic, or other poisoning.

Treatment.—The treatment of multiple neuritis consists primarily of rest in bed and the removal or limitation of the cause which is usually a definite one—septic, metallic, or malarial. During the height of the malady the sensory symptoms, particularly pain, require alleviation, and for this, heat, or heat and cold, are best. Next comes the upbuilding of the general health by general hygienic and tonic measures, and finally the repair of the paralyzed nerve and muscle. Warm baths, systematically and frequently given, are useful in most cases to produce a variety of results,—relief of painfulness and restlessness, stimulating or tranquillizing to the circulation, and aiding in securing sleep. If the pain be excessive, small doses of analgesics are suitable, of which the best is opium or the coal-tar preparations, used with caution ; the salicylates are not particularly useful ; chloral by the rectum is sometimes of value. Where the nerve-sheath is involved mercurial inunctions have been used with success, either the unguentum hydrarg. or a five to fifteen per cent. ointment of the oleate of mercury. Arsenic is positively dangerous. In the majority of cases general tonic remedies will be sufficient,—cod-liver oil, quinin, and strychnin. In the malarial form quinin is necessary as a specific, with perhaps minute doses of calomel to aid its action. When the paralytic symptoms appear the galvanic current is useful both as a sedative and tonic ; where the faradic current produces contractions it is useful as a muscle stimulant, but is not to be used where there is hyperesthesia. Contractures may be overcome by gentle massage, later by forcible overextension. If these deformities be permanent, tenotomies and orthopedic apparatus are indicated.

Potassium iodid is of service as an eliminant where much perineurial exudate exists.

DIPHTherITIC PARALYSIS.—Paralysis, more or less severe, follows a large proportion of cases of diphtheria, and bears no relation to the severity of the attack, nor to the previous health of the patient, and may occur within the first week or not until several weeks have elapsed. Diphtheritic palsy generally follows a particular order; the palate is usually the first and often the only part affected, shown by the regurgitation of liquids through the nose and a nasal articulation. If this extends, the upper and lower extremities may be affected, at first as a mere weakness and later as a complete paresis, and is generally accompanied by marked disturbances of sensation. The sixth nerve is often affected, supplying the external rectus muscle. Complete oculomotor palsy is rare, but ptosis and weakness of one or more muscles supplied by the third nerve is often seen. The pupillary reaction is often sluggish, with impairment of accommodation. The epiglottis is sometimes paralyzed and is a source of distinct peril. The reflexes are generally diminished or lost, even in some instances where there is no actual paralysis. Cardiac failure following upon diphtheria, especially where there are irregularities of respiration, is probably due to loss of function of the vagus.

The **prognosis** is distinctly favorable, though the course may be most protracted. Where a single nerve is affected the recovery is more prompt. Hysteric palsies may be superadded to the original lesion, and this possibility must be carefully considered where the case is long in recovering. A return of reflexes and electric reactions points clearly to repair of the nerve, although the muscle atrophy may prove troublesome.

The **treatment** consists of general measures directed to the repair and maintenance of strength. Feeding should be particularly insisted upon, and where the palate is paralyzed, solids are more easily swallowed than liquids. If the difficulties of deglutition be extreme, the nasal tube should be used, or rectal feeding may be necessary. Upon the slightest suspicion of heart-weakness, cardiac tonics should be given—digitalis, strychnia, caffeine, and hot drinks. For respiratory weakness, direct excitation of the phrenic nerves by slowly interrupted faradic currents will give good results.

Lead paralysis occasionally occurs in children, as has been proven

by the researches of Dr. Putnam, and should not be overlooked. It usually occurs in the extensor group of muscles of the forearm, producing wrist-drop. There is usually along with this a marked cachexia, pallid skin, severe headaches, and digestive disturbances. The prognosis is favorable for the paralysis, but danger exists from profound nutritional disturbances and the effect of the poison upon the brain.

Treatment consists of general measures and the administration of iodids in moderate doses, besides warm baths and gentle massage.

TETANUS.

Synonym.—LOCKJAW.

Tetanus is an acute infectious disease of the central nervous system, characterized by continuous tonic spasms, with marked exacerbations, affecting, as a rule, the muscles of the jaw and the back of the neck. There are at times also clonic movements. There is much ground for belief that the primary predisposing cause of the trouble is always an injury, through which the bacilli of tetanus enter and infect; also some favoring condition of the wound or some concurrent infection, or both.

Causes.—The direct cause of tetanus is the bacillus of Nicolaier,—a slender rod with rounded ends. Tetanus occurs about five times as often in males as in females, a fact which emphasizes the necessity of a traumatism as the instrumental cause. It occurs most often between the ages of ten and forty years, but may arise at any time of life. The tetanus of the new-born begins, as a rule, between the fifth and tenth day after birth, thence up to twenty days. The entrance of the bacilli here is by way of the umbilical cord, and it must be admitted as possible that other toxic agents may thus irritate the nerves of a newly born child. Colored people are more subject to tetanus than white; the filthy much more than the clean, everywhere. Puerperal tetanus is rarely seen where modern surgical principles prevail, in obstetric as well as in surgical practice. The feeble are no more subject to tetanus than the robust. Tetanus may follow the greatest variety of injuries. Punctured and contused wounds of the hand and feet are supposed to be most liable to this infection, but it may follow upon many minor injuries. It is more common in very warm than in temperate climates.

The development of tetanus requires usually a few hours, but may occur at once after an injury or operation, but as a rule takes from one to two weeks and may take four.

Symptoms.—There may be some prodromes, sometimes a chill, indistinct pains about the injured part, or a dull headache; but the first distinct symptom is a feeling of tightness in the jaws, difficulty in mastication, and a gradual stiffening of the muscles of the neck, back, and lower extremity, until opisthotonos is produced, or of the jaws until these are firmly clenched (trismus). Later, the legs become rigid, but the arms escape, as a rule. The muscles of the face assume a characteristic contraction, especially about the mouth, giving rise to a Sardonian grin or smile. Now and then the attack is associated with paralysis of the facial muscles. Along with muscular contraction is pain. The contractions of the thoracic muscles and the diaphragm may imperil life by interference with breathing. Swallowing is also interfered with, and the muscular pains grow worse and worse until the child is in agony. All this may cease during sleep, but on the instant of wakening the distress returns with full force. The pulse is rapid and feeble, possibly due to vasomotor involvement. The temperature varies much; in some instances it may remain normal throughout, in others elevated two or three degrees. Sometimes it runs very high, to 108° or 110° F., and is probably then due to an intense effect of the toxins circulating in the blood upon the heat centers. Thirst is often great, aggravated by the profuse perspiration and the difficulties of swallowing water. Urination is irregular and the bowels are generally constipated. Death, when it occurs, is usually from failure of the heart or asphyxia, from spasm of the glottis, or exhaustion from the difficulties of swallowing food. Most cases die within a fortnight, usually in four or five days. If the patient survive the first two weeks, recovery may be looked for. In the tetanus of the new-born, those cases in which fever occurs seem to be fatal.

Pathology.—The essential pathology of tetanus is not yet demonstrated. In fact, no characteristic lesions have been found either in cord or brain. Rigor mortis sets in almost at once. Congestions in different parts and granular changes in the nerve-cells have been demonstrated. The cause of the malady is the bacillus of Nicolaier, which is found in the soil and the dust of dwellings. It is shaped much like a stumpy pin, and is capable of resisting great heat for a

long time. These bacilli produce several poisons, tetanin, tetanotoxin, and also toxalbumins, which when circulating in the blood are probably the cause of the disease. Oxygen is destructive to these bacilli, which helps to explain why cleanliness limits their action. Bacteriologic researches have helped enormously to explain results and guide in the treatment. Behring and Kitasato have demonstrated the fact that the blood-serum of tetanic animals produces immunity in others, and the animals thus rendered immune have powerful antitoxic qualities producing curative effects.

Diagnosis.—The diagnosis of well-developed cases following external injuries is easy. Tetanus may be mistaken for hydrophobia, but in this there is no trismus, and always a history of dog- or other animal-bite, and the spasms are produced only on attempting to swallow. From tetany a diagnosis may be made by remembering that in this the mode of onset is from the periphery inward, and also through Trousseau's sign, which is, that in tetany a spasm may be brought on by pressure on the large nerve-trunks and arteries of the extremities affected, and that this ceases as soon as the pressure is removed. Strychnin poison also resembles tetanus, but never begins with trismus. There is also much more rapid development than in tetanus and pains in the stomach, the primal rigidity being in the extremities and posterior neck-muscles.

Prognosis.—The mortality in tetanus is eighty-five per cent. in traumatic cases, in idiopathic under fifty per cent.; a favorable symptom is the length of interval between the injury and the first spasms. Much hope is aroused by the discoveries of Behring, in the matter of immunization, which may in time control the disease.

Treatment.—The treatment of tetanus consists in prevention. Wounds which are made by the surgeon are under absolute control and should not be a source of infection. Wounds of hands and feet incurred by accident should be treated aseptically at once, and small harm will follow. If tetanus set in, general measures must be instituted bearing in mind the exalted state of motility. Quiet, darkness, and isolation should be secured. All moving and handling and feeling the patient should be done gently and slowly. If the jaws be locked, a wedge may force the teeth apart to introduce food by tube or otherwise. If this fail, the tube can be passed through the nose, or rectal feeding may be employed.

To limit the spasm chloroform inhalations are very useful, also nitrite of amyl, which may cause the spasms to be greater at first but lessened afterward. Chloral hydrate helps to produce sleep, and may be administered by the mouth, rectum, or hyperdermatically; five to fifteen grains may be given at once and repeated several times a day. Opium and morphia are also most helpful. Curara, Calabar bean, Indian hemp, belladonna, and other drugs have been much used and with reported good results. Warm baths are sometimes of use. The greatest possibilities exist in the injections of antitoxins or any substances which may hereafter be shown to possess the power of counteracting the poison in the human system.

The action of the antitoxic serum is limited; it can not directly act on the tetanus poison and destroy it, nor undo the damage done; it can only prevent further damage; moreover, a case may go on to fatal termination even after the blood has been rendered antitoxic (Roux). It must be used early and in full abundance to be of value.

In diphtheria the position and character of the lesion is a prompt warning, but the poison of tetanus is insidious, often causing irreparable damage before symptoms show clearly (Lambert). Preventive inoculations are most effective, and should be used in dirty wounds at once when and where tetanus prevails (Bazy).

To sum up, use local disinfection, physiologic antidotes to tranquillize the disturbed spinal cord, and give antitoxic serum; limit and control progressive action of the toxin.

TETANY.

Tetany, or tetanilla, is a lesser tetanus, characterized by attacks of tonic spasms, either paroxysmal or continued, of various groups of muscles, particularly those of the upper extremities, and is very much rarer in America than in Europe.

Attacks can be induced by compression of the arteries and nerve-trunks in the affected extremity in one who has exhibited symptoms of the disease, but who may not give evidence of it.

Causes.—The exact cause of the disease is unknown—it may be some form of microbe. It is, however, a disease occurring epidemically and sporadically chiefly in young persons, the majority of whom are from sixteen to thirty-five years of age. A large proportion of

cases occurs in children from one month to five years. Any exhausting disease, such as typhoid fever, small-pox, malaria, Bright's disease, etc., may act as a predisposing cause in those who are prone to this form of spasm. In some it has appeared on the removal of the thyroid gland. Dilatation and lavage of the stomach seem to have a predisposing effect in bringing on tetany. The epidemic form appears as a rule during the winter season. Both sexes are about equally affected.

Symptoms.—The attacks of tetany are preceded by a period of latency. The early phenomena are alterations of sensibility, tinglings and tickling in the hands, forearms, and legs; soon after stiffness occurs, and later tonic muscular spasms. It is common for the fingers to be grouped to a point, each being held straight,—“the hand of the accoucher”; the stiffness varies much with the group of muscles affected. The forearms are liable to be flexed, and the upper arms pressed close against the body. If the legs are affected they may be extended or flexed and the foot assumes the attitude of talipes equinus. The muscles of the back, abdomen, and chest may also be affected, interfering with the respiration and causing dyspnea. Trismus is rare and never occurs early. Opisthotonos occasionally is seen. In severe cases the eye-muscles are in spasm, also those of the esophagus and larynx. In children the attack may pass off in a few hours, but in the adult it is more prolonged. Fever is rarely of considerable degree. Excessive perspiration appears now and then, a ringing in the ears, vertigo, and headache. The motor disturbance in tetany proceeds from the extremities to the center, not from the center outward as in tetanus. The attack may last only a few minutes, or hours, or days, with intervals short or long of complete immunity. Tetanus is continuous. During the period of latency, or periods between the attacks, the patient may seem quite well, but suffers from a weakness and slight rigidities. These intervals are from a few hours to several days, even months. To ascertain whether the disease has disappeared there must be no longer evidence of an increase of electric and mechanical excitability, and, moreover, Trousseau's symptom must have disappeared. This phenomenon is the production of an attack in a patient who has exhibited tetany (but then quiescent) by pressing upon the large nerve-trunks and arteries of the extremities, which had already been affected. The attack may cease as soon as the pressure

is removed. During latency, too, there is a greatly increased electric excitability, especially in the motor nerves. There is greatly increased mechanical excitability, more important than the electric. Pressure upon focal points produces almost the same effect as electrization.

Diagnosis.—The disease is easily recognized. The differentiation between tetany and other convulsive disorders is not difficult, the one disorder most closely resembling it being tetanus. Tetany is intermittent, the movements and contractions being at times absent for days or months. The attacks proceed from the periphery to the center; in tetanus from the center outward. Trousseau's symptom—the bringing on of a paroxysm by pressure upon the nerves and arteries in the affected part—is pathognomonic. Epilepsy resembles tetany, but the loss of consciousness usually present is absent in tetany; so also is the subsequent stupor. Hysteria is detected by watching for stigmata of that disorder.

Pathology.—Little is known as yet of the pathology of tetany, except that it is a very general irritability of the nervous system, probably an increased excitability of the gray matter, chiefly of the brain, medulla, and cord. A zymotic factor enters into the etiology, but the morbid agent is not known. It is necessary to avoid confounding carpopedal spasm or other of the spasms so frequently occurring in children with tetany.

The extirpation of the thyroid gland has been followed by tetany.

Prognosis.—Tetany rarely produces death, but may throw a heavy burden upon respiration and thus damage the lungs. It may last, with intervals of latency, weeks and months. Hence the prognosis as to duration should be guarded.

Treatment.—Tetany is somewhat similar to the mild, convulsive conditions in children generally, and is to be treated much the same way. Remove all peripheral irritations, especially intestinal, by calomel, castor oil, or vermifuges. Absolute rest in a quiet, darkened room must be secured, and this may require morphia hyperdermatically, or hyoscin hydrobromate. Ice to the back of the neck is soothing. As a routine measure, chloral, codeia, and the bromids are of value; or other motor depressants, such as sulfonal or trional. Hydrotherapeutic measures are of use. Massage, electricity, and spinal ice-bag have been used with success. Nutritional tonics are needed: cod-liver oil, iron, malt, etc. Digitalis has been found of use, given

at night. Thyroid extract has been tried with success. Calabar bean has been of service.

SIMPLE CEREBRAL MENINGITIS.

Simple cerebral meningitis, leptomeningitis, or purulent meningitis, is an inflammation of the pia mater of non-tubercular origin.

All forms of meningitis have much in common, and the description of any one is much the same for all, especially the clinical history and treatment, which will be considered together. Cerebral meningitis may be divided into the acute, subacute, and chronic.

Causes.—Simple meningitis occurs most frequently in the first two years of life, then rarely until after fourteen; and between the years of sixteen and forty-five it becomes again much more common. It is essentially a disease of childhood, and is undoubtedly more common than we have evidence to prove.

Exciting causes are the staphylococcus and streptococcus; and the predisposing causes are injuries to the head, extension of the middle ear or adjacent inflammations, specific diseases like pneumonia, scarlatina, erysipelas, pus-producing organisms, emboli, and thrombi. Symptoms simulating meningitis often occur in the progress of acute rheumatism, which reveals nothing postmortem. Trousseau calls these neuroses.

Very slight traumata are many times the probable causes; also the effect of intense heat, as of the sun; also acute nephritis.

Symptoms.—The early symptoms are very obscure—a mere indisposition to play, a slight uncertainty or tottering in the gait, a tendency to sit quiet, with some nausea and vomiting. All these phenomena may pass away in a few days; or, again, the vertigo may increase; the headache become severe, the child boring its head into the pillow, swaying it from side to side; and the nausea and vomiting become more frequent. The ejections are of the true cerebral type, quite causeless, so far as the stomach is concerned, and flung straight out of the mouth,—“projected.” If vomiting occur independently of food or its changes, and associated with a clean tongue, the probability of its being of cerebral origin is very strong. However, there may just as well be a coating of the tongue (its absence does not forbid the

suspicion of cerebral disease), moderate irregular fever, loss of appetite, constipation, headache, and a general apathy. Gradually the child grows more listless or stuporous, sleeping much and crying a great deal. It may become fretful and restless; convulsions may occur. A common feature is hyperesthesia, especially to light or touch. Should the base of the brain be involved, the symptoms are identical with those of the tubercular form.*

The temperature runs from 101° to 104° ; the pulse is at first rapid, then becomes slow and irregular. At first the pupils are contracted and subsequently dilated and fixed. The neck and limbs usually become stiff. After a time the apathy deepens into coma; convulsions occur later. The deep reflexes are generally increased; the abdomen becomes retracted. The bowels are generally obstinately constipated, and finally the stupor is so extreme that the child seems all but dead,—can not take or retain food, and yet lives on. It may be that the sphincters are early relaxed, or only toward the end. There was, for a long time, much importance attached to a local vasomotor palsy following a light scratch on the skin, called the “*tache cerebrale*,” but this has little significance. All these symptoms may arise in about a week or ten days. Paralysis occurs in some cases, very like those due to apoplexy, or may be local, as of the eye. Sight may be lost or suspended. If the case tends toward recovery, all these symptoms gradually pass away; or if toward death, opisthotonos is developed, coma deepens, the sight goes, respiration becomes irregular, usually of the Cheynes-Stokes type, until it ceases. At times, perfect recovery takes place, but optic atrophy remains.

We have reported elsewhere the case of a little girl who, when seven weeks old, was most brutally set upon by an older child and pounded unmercifully; thereupon ensued a miserable sickly state for several months, and finally there occurred an attack very like acute rheumatism, but proved to be a furious condition of meningitis, and in a month's time she got well. The child has been under our observation ever since, now quite ten years, and although in poor circumstances,

* We know of a child at the Children's Hospital in whom photophobia was so severe that its habitual attitude was that of a tripod: its face buried in the pillow and its two legs well apart and almost straight. It finally died in this standing position and remained rigid until it was discovered that its spirit had fled.

living mostly in unhygienic surroundings, it is now of a magnificent physique but of questionable mentality.

Morbid Anatomy.—In simple acute meningitis the membranes are opaque, characterized by thickening and congestion with infiltration of purulent fluid. The inflammation of the pia is usually accompanied by slight involvement of the dura and the substance of the brain. The exudation may be purulent or non-purulent; there is increase of the cerebrospinal fluid, opacity of the arachnoid and edema of the brain substance. The part most extensively diseased is the pia of the convexity, that of the base being usually free. The ventricles are overdistended by fluid. The blood-vessels of the pia become engorged with extravasation of leukocytes. Postmortem, will be found a gluing together of the pia and outer layers of gray matter.

Diagnosis.—Certain symptoms are common to all forms of meningitis; these are vomiting, headache, irregularity of the pulse, unequal pupils, convulsions, and coma. In the graver forms of meningitis we have, in addition, high fever, symptoms of basilar irritation, progressive emaciation, and a rapid increase of all the symptoms. To distinguish between different forms of meningitis is always difficult, and many times will require waiting for later developments which may be recovery or death, and to be confirmed if possible by autopsy. Many acute infectious diseases are accompanied by pronounced meningeal symptoms which pass away with the severity of the attack.

Course and Prognosis.—A case of simple meningitis continues for about one to three months. Some cases recover—a very few—and remain perfectly well; there usually follows serious impairment to many organs, the most important of which is the brain. Blindness is not an uncommon result, and many deformities, paralyses, and contractures. Where the case tends toward a fatal result the symptoms grow steadily worse, the respiration becomes more and more feeble, and death results from simple exhaustion or some complication, such as pneumonia.

Treatment.—There are many forms of meningitis, and the principles of treatment are the same, whether these be due to a distinct inflammation of the meninges or mere hyperemic states which arise in many of the infectious processes. The treatment as given here is suitable for all of these, with such modifications as may be necessary for special causes. First, place the child in bed in a darkened room

and in the charge of a thoroughly competent nurse. The bowels should be emptied promptly; nothing is better for this than calomel along with, or followed by, a saline. A good form is $\frac{1}{10}$ of a grain of calomel to two grains of Rochelle salt every half hour. Cold is useful in the form of ice-bags to the head or neck, but must be sedulously watched. Warmth to the feet is of value and comforting. If the temperature runs high, a warm bath— 85° to 95° F.—gradually cooled, may be cautiously given. Bromids should be used from the beginning if the stomach will endure them, if not, codeia; or if convulsions or restlessness be severe, chloral, two to five grains, by the rectum. The calomel may be continued in smaller doses, or inunctions of mercury, ten per cent. of the oleate or the unguentum hydrargyri. If the stomach retains well, the protiodid of mercury may be given, or the bichlorid with iodid of potassium, continued for some time.

In more subacute or chronic cases shaving the head and repeated blisters applied to the scalp is of great service to relieve pain and for its sorbefacient effect.

TUBERCULAR MENINGITIS.

Tubercular meningitis, also called **basilar meningitis**, is a local manifestation of tuberculosis usually at the base of the brain, characterized by marked cerebral symptoms due to deposits of tubercles in the pia mater; and, since there is usually effusion of fluid into the ventricles, it is also called **acute hydrocephalus**.

In many instances the symptoms may be divided into three stages: the first of hyperemia and irritation of the pia; second, transudation, pressure, and local anemia; third, an overwhelming of the integrity of the centers. Children of tubercular predisposition, or who may be subject to the infection of tuberculosis, are liable to this form of meningitis. Therefore, it is important to note the earliest symptoms of onset, which, if proper measures are then used, might possibly result in cure, although it is doubtful if a true case of tubercular meningitis ever got well.

Causes.—An hereditary predisposition to tuberculosis is the usual origin. Tubercular infection is the direct cause, and this may come from other deposits in the same individual. In children the disease is often apparently primary.

Tubercular degeneration of bronchial glands, which, breaking down,

allow the poison to be carried into the circulation, has been pointed out as a potent factor in causation. The direct cause is always the invasion of a poison which, according to our present knowledge, is recognized to be the tubercle bacillus which spreads along the lymph-channels, exciting inflammation. The chief danger lies in an unusual vulnerability, probably congenital, on the part of the tissues. Abundant opportunity for infection comes also from without through various articles of food, breast milk or cows' milk, and by inhalation. Bad hygienic surroundings favor its development. (See Tuberculosis.) Most cases occur between the second and seventh years.

Symptoms.—The onset of tubercular meningitis is insidious, with certain prodromal symptoms; the child becomes listless, dull, and ceases to play; when disturbed, it becomes irritable and exhibits various gastric disturbances, especially nausea, and perhaps for a week things remain much the same. Sleep is somewhat disturbed. If these symptoms fail to disappear, the vomiting becoming more frequent and causeless, the headache more intense and persistent, associated with fever, coated tongue, lost appetite, constipated bowels, the occasional occurrence of the distressing hydrocephalic cry (a shrill scream caused by intense headache), then our fears become graver. If there is then observed slight stiffening of the neck, a slowing of the pulse, and increasing prostration, painfulness on every passive movement, unequal pupils, reacting slowly to light, diminished conjunctival reflex, with clouding of the cornea, convulsive seizures of the Jacksonian type, there is little room for doubt. Attempts at swallowing may be accompanied by slight trismus. Close examination may reveal slight palsies of some branches of the facial nerve of one or both sides. The fundus of the eye discloses a hyperemic and swollen condition of the papillæ, or in some instances optic neuritis. Stiffness of the muscles of the back is nearly always present, amounting sometimes to opisthotonos. Paralysis occurs of branches of the facial nerve uni- or bilateral, and other changes in the cranial nerves, pointing to an involvement of their base. The "tache cerebrale" is easily produced—a common feature in many states of lessened vasomotor tone. The extremities may be palsied more or less severely, but the degree of this is most difficult to learn, voluntary action being suspended and passive movements presented. The surface reflexes become diminished or lost, but the deep ones in the extremities are, as a rule, exaggerated.

The belly becomes scaphoid, convulsions now and then appear, general in character but not to the extent that the involvement of the pons and medulla would lead one to suppose; at last the paralysis may become more complete, the pupils dilated, and the temperature drop to 95° or 94° F.

The position of the child in bed is usually on one side with limbs drawn up, fingers clenched over the thumb, head strongly retracted. Later on, delirium may develop, with rapid and irregular pulse; the temperature falls; respiration assumes the Cheyne-Stokes type. The duration of this disease is from three to six weeks. In some cases there is greater or less degree of paralysis due to pressure of the excessive exudate. This paralysis may be of the upper or lower extremities.

Cutaneous reflexes throughout the entire body are lost. Deep reflexes, as a rule, are increased. It needs to be emphasized that in the course of this disease there are periods when the patient feels much improved; this inspires false hopes in the parents. Often both physician and parents are deceived in this, a recrudescence occurring later, carrying off the lingering sufferer. We have a case in mind where this marked evidence of vitality lasted many weeks with transient palsies, before final dissolution came.

Morbid Anatomy or Pathology.—There is singularly little to be seen in the macroscopic postmortem appearances of the brain in cases of tubercular meningitis. At the base evidences of the disease are usually apparent: the pia cloudy and protruding. Tubercles are most liable to be found in the interpeduncular spaces and scattered about the pia, pons, medulla, and spinal cord.

There may be no tubercles seen and almost no signs of inflammatory process. But in well-developed and severe cases the presence of small yellowish nodules along the blood-vessels of the Sylvian fissure are noticed. The disorder, however, belongs to the infectious processes and is a part of a general tubercular infection. There is increase of fluid in the ventricles. The ependyma is edematous and soft. Death is due in great measure to the general effect of the tubercular poison and its ravages in other organs.

Diagnosis.—The difficulties of differentiation between the tubercular and other forms of meningitis are exceedingly great. The average practitioner should not allow the basilar symptoms to escape him. An acute ocular palsy or beginning optic neuritis points directly

toward the basilar or tubercular form. Symptoms pointing toward an involvement of the convexity, such as the vomiting, temperature changes, etc., occur more frequently than in the other forms.

Course and Prognosis.—Tubercular meningitis lasts from about three to six weeks. Those who die within a week or so exhibit less postmortem changes, and death is probably due to a general toxemia. The prognosis is bad enough, but must always be guarded because the diagnosis is often impossible. We have seen a case at the Orthopedic Hospital of gravest severity, and apparently tubercular meningitis, get well, except that the child became an imbecile.

Treatment.—No care must be omitted in the endeavor to mitigate the sufferings or conserve every possible chance for recovery in the sufferers from tubercular meningitis.

The first thing is absolute rest, quiet, and darkened room; next is a thorough calomel purge, cold to the back of the neck, and warmth to the extremities if these seem to relieve. Whatever makes the patient irritable or disturbs in any way had best be abandoned. Sleep is much more important than food.

The heart action and respiration must be maintained; for this, digitalis and coffee are of value. The food should not be given too often lest the stomachic disturbance thus likely to be caused do more harm than good. Concentrated animal extracts, home-made beef-teas and various broths, and peptonized milk, are all easily swallowed and should be given in shorter intervals and in lesser amounts if rejected, but ordinarily two hours is enough. There comes a time when it may be more merciful to parents, attendants, and also the child to regard the case as hopeless. Surgical interference has been attempted and the patient recovered. Interference with the knife probably acts *per se* or by "changing the character of the inflammation," as is evidenced by notable cures not uncommon in tubercular peritonitis, or in tubercular joint lesions. Lumbar puncture relieves tension and restlessness and is entirely harmless. We have reported cases where this operation profoundly mitigated the symptoms, and one case lived for a long time (months) afterward.

INFANTILE CEREBRAL PALSIES.

Cerebral palsies occur in children in four forms: Spastic hemiplegia, diplegia, paraplegia, and monoplegia. The onset of these is in three

periods, (1) during intra-uterine growth; (2) during labor; and (3) after birth. They occur more frequently in the earlier years, up to ten, mostly before three; seven per cent. are congenital. The palsies are spastic in type (tending toward spasm), and may be of one side (hemiplegia); of both sides (diplegia); of one-half of the body below a certain level (paraplegia); or of one limb (monoplegia); this last is very rare. Certain special features are common to all these forms of palsy, rigidity of the muscles, contractions of tendons and exaggeration of all the deep reflexes.

Convulsions and coma commonly precede the diseased state.

Most cases of diplegia and paraplegia are congenital, while most cases of hemiplegia are acquired after birth (Peterson).

Causes.—Prenatal palsies are due to many causes. Trauma to the mother during gestation, especially septic processes, and such as powerfully disturb the circulation; the toxins of the zymotic fevers, pneumonia, anemic states, along with frequently degenerative changes in the blood-vessels.

Convulsions in the mother result in retardation of fetal brain development; so do psychic and emotional shocks, nervous and other strains.

The chief cause of paralysis during parturition is a slow labor, exercising a long-continued compression on the fetal brain and circulation, producing meningeal hemorrhage or thrombosis. This is most common in first-born children. The use of instruments to relieve this tardiness, though it may occasionally work havoc, yet affords rather a means of prevention in most instances by relieving the over-prolonged, intracerebral blood pressure. Mere rigidities are the result of surface lesions; the more profound the palsy the deeper the lesion.

Acquired paralyses are largely due to the acute infectious diseases. Whooping-cough and pneumonia, by repeated and severe acts of coughing, superinduce vascular engorgement from which may result escape of blood and cortical damage.

Traumata, fright, and various forms of convulsions are instrumental factors many times, especially in those of feeble resistance and neuropathic predisposition.

Symptoms and Description.—The cortex being the usual seat of lesion, convulsions and coma are customary symptoms of onset. After a difficult or prolonged birth, or one not conspicuously tedious, there may soon appear cyanosis, asphyxia, or convulsions. The infant

may exhibit none of these but only extreme feebleness. If cerebral damage has occurred, however, there will later be noted imperfect or delayed coördinations, awkwardnesses, grimaces, etc., some of which will pass away, yet much will remain or change to rigidities, athetosis, and the like. The continuance of convulsions constitutes epilepsy, a common result of the characteristic lesions. The paralysis is most obvious in the limbs, taking the form of hemiplegia (of one side), both arm and leg being affected more or less; in both arms and both legs (double hemiplegia or diplegia); in both legs (paraplegia); or, very rarely, in one limb only (monoplegia).

When the leg and arm are both affected, recovery takes place first in the leg and later in the arm, but this result is seldom perfectly attained. In a few instances all recognizable palsy disappears, leaving other phenomena to mark the central damage. The face is sometimes involved, commoner in the diplegias; one side of the face may be paretic and the other contracted.

Speech defects remain in a large number of cases, especially the congenital variety and earlier palsies—and this from damage of which-soever side.

Centers for articulate speech are not determined in the left side very early, and their development is easily interfered with.

Exaggeration of the deep reflexes on the injured side is the rule, though in a small proportion of cases these are lessened or normal. Contracture and rigidity mask this phenomenon at times. In a certain few cases of arrested cerebral development the palsy is flaccid.

In our experience, the knee-jerk and arm-jerk are markedly increased as a rule; and ankle-clonus and ankle-jerk are generally to be elicited in excess (the lesion being in the first division of the motor tract).

The gait is characteristic, consisting of a springy action of the leg, which is dragged forward with an obvious effort and planted with a jerk. The shoes on the palsied leg show evidences of extra wear. The arms are waved about and extended over much in the effort to balance the body, which shares in the spasticity of the limbs, especially while in action, one voluntary movement helping to reinforce that of other parts. The foot, too, comes to earth with the ball or toe down, and the sufferer pitches toward the affected side and then places the sound foot less in advance than the other.

In diplegia and paraplegia there is a doubling of this strained

effortful gait; and the absence of one sound limb to support the other, with the consequent loss of balance, causes each leg to describe a half circle or more, and the foot to cross over in front of the other.

In one typical case in our practice, that of a peculiarly vigorous girl, she swings along with fair speed, occupying much space laterally, hands extended to poise, resembling a bundle of steel springs vibrating—and is merely a vivid illustration of the usual type of progression.

Postparalytic disturbances of motion are notable features, being more common in the child (one-third of cases) than the adult. The forms most common are, in their order of frequency, choreiform, rhythmic, and associated movements. To this may be added the contralateral adductor spasm, which one of us studied carefully.*

The choreiform movements (described first by Weir Mitchell as "postparalytic chorea,") are easily and frequently mistaken for chorea. This can be differentiated by the exalted state of the deep reflexes, contractures, tremors, etc. These hyperkinesias or exaggerations of movement may follow other states than paralysis, as the athetoid movements in the fourth of Freud's diplegic types (Mills). The atrophy often seen is not a true muscular wasting so much as a failure to develop from restricted activities.

In most cerebral palsies there is more or less obvious asymmetry of both the body and the skull. Along with deformities of the cranium and other evidences of degeneracy, the most distressing symptoms of cerebral atrophies is the epilepsy so commonly present. The palsy may fade away and leave this blight for life; which, by the way, it aids materially in shortening. Idiocy or imbecility very often is a resulting and conspicuous feature; oftener in diplegias and paraplegias, there being here a double lesion involving larger areas of brain structure.

Morbid Anatomy.—In the case of cerebral palsies occurring before birth, the lesion is usually a widespread meningeal hemorrhage involving both hemispheres. This may merely check development or produce loss of tissue, and is most destructive to functional activity, bodily and mental. Death, happily, occurs often at once or very early, nor do the sufferers survive long, as a rule.

There may be found porencephaly (limited absence of brain tissue) or cysts, confluence of fissures or other conspicuous deformities. In

* "Internat. Med. Magazine," June, 1895.

addition, there are more minute changes, such as defective development of the cellular elements in the cortex and pyramidal cells constituting *cortical agenesis*. Epilepsy is a common result, while idiocy is the rule.

The resulting lesions of acute apoplexies are not so clear, but consist of atrophies, sclerosis, and other changes, due to hemorrhage, also embolism and thrombosis. Fatty degeneration of the blood-vessels is the probable explanation of the escape of blood in a large number of cases; also the more delicate and vulnerable condition of the blood-vessels in the young. Heart lesions, pneumonia, and other infectious diseases, predispose to embolism. The form would probably be softened and hemorrhagic areas with ruptured vessels, leukocytes, granular cells, and neuroglial proliferations (Mills).

Whatever be the initial lesion of an acute cerebral palsy when the patient survives, secondary changes occur concealing the first cause, and hence arise atrophies, areas of softening, sclerosis, and the like.

The sclerosis is largely responsible for the idiocy and epilepsy, transverse fibers connecting intimately all parts of the hemispheres.

Summary of the Effects of Cerebral Palsies.—The face is occasionally affected, but recovers most rapidly and completely. Palsy of the muscles of the eye now and then persists, especially strabismus. Defective speech is common in all cases, due to a variety of causes, mechanical as well as intellectual. Aphasia occurs where the lesion is on the left side as well as on the right. The deep reflexes are exaggerated, especially in the paralyzed limbs, but may occur in both, even in one-sided palsy. In five per cent. these may be normal, lessened, or absent. Rigidity in the limbs may mask this, especially the ankle clonus or triceps jerk; morbid movements are exceedingly common. "Athetosis," or restless ataxia, occurs in twenty per cent. of the cases. There are frequently also associated movements and imitation, by the hand or limb not in use, of the movement voluntarily made by the opposite limb. Choreiform movements are more frequent in hemiplegias and rare in diplegia; other disturbances of movement are rhythmic contractions, tremors, tetanoid states, and nystagmus. Rigidity and contractures are common and graphic features of nearly all of these palsies; hence they are liable to apply to the orthopedic surgeons rather than to the physicians, and the orthopedist should in all instances take charge of these cases and relieve

deformity to the uttermost possibility. The adductor spasm of the thighs induces a crossed-leg progression, which impedes movement very much; this in most instances can be partly relieved by tenotomy and overstretching. Talipes equino varus is also common in hemiplegics. It is customary to find in all forms of cerebral palsy rigidity with contracture, but occasionally a case of flaccid paralysis appears, and these are probably the result of arrested development rather than of a degenerative change. There is much less trophic disturbance than in spinal palsy; nevertheless, there is a localized retardation of growth, especially in the cases beginning early, the limbs developing in fair proportion, but much more slowly, failing to attain the full size and vigor of the opposite limb. The whole organism suffers; full stature is almost never attained. Occasionally there is seen the same localized blueness and coldness in the extremities observed in spinal palsy. Spinal lesion may coexist with the cerebral. Epilepsy occurs in forty-five per cent. of all cases of cerebral palsy. The convulsions are usually general, but in fifteen per cent. they are focal or Jacksonian. It is essential always in examining an epileptic to search for evidences of a cerebral palsy. Feeble-mindedness, imbecility, and idiocy are also often seen in a direct ratio to the extent of the pathologic process; more commonly in diplegias and paraplegias because of the larger areas of brain involved. Mental defects are rarer in hemiplegics, although in nearly half the cases of cerebral palsy of whatsoever degree there is evidence of mental deterioration. There will also be seen the various stigmata of degeneration, cranial deformities, asymmetries, gothic palate, deformed ears, hairiness, etc.

Prognosis.—It is far from unfortunate that children marked from the beginning rarely survive; those who do are liable to develop idiocy as well as epilepsy, and become irretrievably lamed or stunted in mind and body. No opinion can be formed as to the degree of crippling or capacity for development in the congenital forms until after some weeks or months elapse. In the double-sided form of brain palsy mental development is most likely to be lacking. So long as contractures remain absent we may hope to recover a fair capacity of muscular coördination.

Differential Diagnosis.—Infantile cerebral palsies are frequently confounded with acute spinal affections. The cerebral cases are characterized by spastic rigidities, contractures, increase of the deep

reflexes, normal electric reactions, and very slight atrophic changes. The forms of palsy are hemiplegia, diplegia, and paraplegia, with very rarely monoplegia; frequent accompaniments are epilepsy, idiocy, and morbid movements. Very mild cases exhibit almost no spasticity or contracture, but rather athetoid or choreic movements; the spinal and the cerebral forms of palsy may coexist in the same individual, arising at different times, and such a complication must not be overlooked. Cases of persistent chorea should be most thoroughly searched for evidences of hemiparesis with mental defects or occasional epileptic attacks, which often are obscure, manifested rather by mental states than disorders of motion.

Treatment.—Recognizing the form of lesion, along with the triumphs of modern surgery, it would seem a most promising possibility to take away a well-localized clot, and thus remove the cause of the trouble; but, alas! the published results of operative interference in cortical hemorrhages of infants and children are most disappointing. The highest authorities agree that the best treatment for infantile apoplexies is almost entirely expectant. Absolute quiet, cold to the head, a clearing out of the bowels, come first; for the convulsions, inhalations of chloroform (or, better, chloroform, three parts; ether, five parts; and nitrite of amyl one part) are very efficacious. (See Convulsions, Treatment of.) After a few days begin with small doses of bromid (and add to this, later, an iodid), continuing for some time. Keep the child perfectly quiet. Feeding should be of the simplest, and, if necessary, by the rectum. No change of posture should be permitted to the child; all shifting of garments should be made by the nurse and with the utmost care.

Counterirritation, mustard baths, and the like, are merely offensive meddling, unless there be marked excitement, when if they do no good they may do little harm. Calomel is of value to secure free purgation often. The bromids and chloral are better given by rectum. Soon the parents will desire treatment for the paralysis and other symptoms, and this, of course, must be forthcoming; but they must have the nature of the lesion explained, making it clear that it is a damage wrought, which becomes almost at once a chronic disorder, and is not an active disease. During the earlier acute processes quiet is imperative, but in a month or two (judged by the grade of recovery) the paralyzed limbs may receive attention in the way of bathings,

massage, and electricity, disturbing as little as possible the brain. The form of electricity to be chosen is mildly increasing faradism; galvanism is not required at all. The electricity serves a valuable purpose in enforcing muscular activities which are beyond volitional control. The degree of current to be used is to be chosen empirically, the gage of which is a moderately full reaction compared with similar healthy muscles in the same child. Our rule is to produce fifteen or twenty good strong contractions by means of the slow, interrupted current, to be followed by from three to five minutes' steady application of the rapid interruption to each half of an affected limb. This is quite enough for a month; in the second or third month this amount may be doubled or trebled at two or three daily sittings.

Next comes massage, which must be given with the greatest delicacy; first simple centripetal strokings for a week or ten days, then cautiously increased gentle frictions, and, by the end of a month or two, deep, thorough muscle kneading and rotation of the muscle masses may be given. Of extreme importance are extensions, counterextensions, and rotations, to prevent and to remedy contractures. Indeed, there is no one agent which helps to restore a paralyzed limb to activity so powerfully as these overstretching movements. The brain centers seem to be thus stimulated. Undoubtedly, well-adjusted apparatus can do much. Once the contractures have been thoroughly formed, the orthopedic surgeon must be consulted, and splendid results are obtained at his hands.

For the athetoid-choreic movements much help can be afforded by fixed dressings and other forms of restraint.

Far and away the most important duty of the physician is to control the epilepsy. This is due to secondary changes in the brain, the outcome of the original lesion, and is focal in character, although not always strictly Jacksonian. Here operative interference promises great things, and is to be recommended when fairly indicated by a clear localization. It may be necessary to continue the use of bromids or other depressomotors. Here trional serves a good purpose, also sulfonal, antipyrin, and acetanilid, as described at length under epilepsy.

TUMORS OF THE BRAIN AND ITS MENINGES.

New growths within the skull in childhood, while rare, have of late been studied so carefully that statistics seem to show them to be far more common than has been supposed. Peterson has collected accounts of a total of 335. The largest number of these are due to tubercle. Glioma and sarcoma are next most common. Cysts are comparatively frequent, resulting usually from some preceding morbid process. Carcinoma and gliosarcoma follow in frequency. The site of the tumor is most often the cerebellum—in more than one-third of the cases. The next most common situation is the pons, centrum ovale, basal ganglia and lateral ventricles, corpora quadrigemina, and crura cerebri. Tumors of the cortex come next, and the other situations, more rarely showing, are the medulla, fourth ventricle, and base of the brain.

Causes.—The causes of brain tumors are exceedingly obscure. Certain new growths arise by extension from deposits of a similar nature in other parts of the body, especially tubercle; this is also true of sarcoma and carcinoma. Accidents often credited with causal agencies are of doubtful potentiality.

Symptoms.—In recording those symptoms which seem to point to new growth in the brain, it is of the utmost importance to be most clear and exact as to the order in which the phenomena begin, for upon this will many times hang the possibilities of localization, or the extent and character of the growth. It is also necessary to record almost every minute detail of history with elaborate explanatory phrases. Thus, and thus only, can the testimony be sifted down by an expert and moderately exact knowledge obtained. The possibilities for help are small enough, but such as exist must be sought for with the utmost solicitude.

The symptoms are divided by Sachs into two groups: the first includes the general symptoms resulting from pressure, and the second includes those due entirely to the location of the tumor. Another very important point is to estimate the degree of rapidity by which the tumor grows, for even the most delicate structures will slowly adjust themselves to pretty extensive pressure, whereas a rapidly growing neoplasm, no matter how small, will markedly derange function. The vascular supply is an important factor to estimate, and the dis-

turbance of large blood-vessels is almost as grave as that of nerve-tracks. The symptoms which point to a new growth within the brain are headache, nausea, vomiting, insomnia, convulsions, and double optic neuritis. Headache in children, especially very young ones, is often not clearly evidenced, but, nevertheless, much of the emaciation and weakness resulting from cerebral tumors is due to the persistent insomnia and suffering caused by headache. The character of the headache, when the child is old enough to describe it, is intense, distressing, deep-seated, and usually referred to that region of the head which adjoins the new growth. When along with this there is nausea and vomiting, practically causeless, we may gravely suspect an intracranial growth, especially where these continue for a considerable length of time. Vomiting is of the cerebral type, coming suddenly at almost any time, often as a complete surprise to the child, and projectile—thrust straight out, or induced by the slightest disturbance. There is also occasional or more or less vertigo, especially associated with cerebral tumors or those of the pons. Convulsions, too, common as they are in children and due to slight causes, add to the gravity of the picture if associated with headache and vomiting, and especially if all these are repeated. Localized convulsions may point to an area of cortical involvement. Double optic neuritis, due, probably to increase of intracranial pressure, if along with continued headache and vomiting, completes the clinical picture of growth within the brain. This may not interfere with vision and hence may not be suspected. A moderate familiarity with an ophthalmoscope is usually sufficient to investigate so conspicuous a symptom. We were able, on one occasion, to thus confirm a suspicion of cerebral tumor in an out-of-the-way country place with an ordinary head mirror and pocket lens. This change is usually observable in both eyes, although appearing in only one for a long time. Along with these conspicuous general symptoms are more or less well-marked disturbances in pulse rate and respiration. The localizing symptoms are numerous but not, as a rule, capable of being interpreted by the general practitioner, but exceedingly important for him to recognize, enumerate, and record. The first of these, called the MacEwen symptom, is percussion over the skull, which brings out local tenderness and increased dullness. This is not always significant of tumor, but may also indicate abscess or overdistended ventricles. Nor is this altogether to be

relied upon even by the most skillful. It is best elicited by auscultatory percussion. Following these indirect or localizing symptoms, as admirably elaborated by Sachs, we may note that tumors of the cortex are not easy to differentiate from those of the subjacent white matter, although the order of development will aid us. Tumors of the motor area, in or near the gray matter, are liable to give rise to convulsive seizures from the start, whereas those beginning in the underlying white matter are more likely to produce gradually appearing paralytic phenomena, and subsequently those of direct cortical irritation. Moreover, the meninges lying most nearly adjacent to the cortex, disturbances thereabout are more liable to produce intense headaches and convulsions.

Tumors of the frontal lobe are lacking in localizing symptoms, except such as have to do with producing changes in character or intelligence, or if low down, in the functions of the olfactory bulb; and possibly disturbances in salivation. The third frontal convolution in which reside the motor centers of the speech function may exhibit motor aphasia or agraphia. If along with these there should be seen localized twitchings, as in the arm or hand, we may suspect trouble in the motor areas of the cortex or lower tracts. Tumors of the parietal lobe are said by Dana to be followed by sensory changes in the limbs of the opposite half of the body; also word-blindness is likely to accompany disturbance of the parietal lobule. Disturbance of the vision may arise from pressure in this locality, although the chief seat of disturbances of sight has to do with pressure in the occipital lobe, especially the cuneus. The temporosphenoidal lobe contains the centers for hearing and for speech, and growths in this region frequently give evidence of their existence by impairment of hearing and by sensory aphasia. Tumors, even very small ones, in the line of the great motor tracts, in the basal ganglia, especially the internal capsule, give rise to a wide variety of morbid phenomena. Tumors of the crura cerebri are to be recognized by the early association of paralysis of both motion and sensation in the opposite half of the body along with oculomotor symptoms, ptosis, paralysis of the muscles governing the eyeballs, the iris, and the ciliary muscle. The close juxtaposition of both peduncles may give rise to paralysis of both halves of the body, or possibly double ptosis, or double oculomotor symptoms. Tumors of the medulla oblongata produce

symptoms similar to those met with in bulbar palsy as well as disturbances of the centers in the fourth ventricle, including disorders of deglutition, in respiration and the cardiac movements and with increased urination or glycosuria. They are bilateral in character, owing to the close juxtaposition of the two halves of the brain at this level. They also involve disturbances of sensation and partial or complete hemianesthesia. Tumors of the cerebellum produce, in addition to the general symptoms enumerated, a peculiar and extensive vertigo or reeling gait known as cerebellar titubation, resembling the staggering of a drunken man, and attributed to a special disturbance of the middle peduncle. Giddiness is a much more constant factor in cerebellar than in other brain tumors; so are affections of the sixth nerve with a resulting paralysis of the rectus externus muscle. The seventh and eighth nerves are also frequently involved and phenomena due to this will aid materially in confirming the diagnosis. At times symptoms of cerebellar tumor are by no means marked, or differ but little from those in other parts of the brain. Paralysis, of one or both sides, follows upon an extension to the pons and oblongata; the reflexes are liable to be exaggerated, but may be diminished or lost.

Diagnosis.—Brain tumors are to be differentiated from chronic hydrocephalus, meningitis, abscess, and cerebral hemorrhage. In the case of meningitis, this should not be difficult if the history of the case is clearly obtainable. Solitary tubercles producing more or less mischief may be associated with meningitis; the cranial nerves are progressively disturbed, and it may be with relatively slight phenomena. Abscess generally affords some history of septic process, and is usually accompanied by fever and not by optic neuritis.

Treatment.—Very little can be expected in the way of treatment for tumors of the brain in the light of our present knowledge, except possibly to relieve some of the more serious symptoms. Postmortem findings show that even with moderately good localization the tumors are, as a rule, practically inoperable. Absorbents such as mercury and the iodids are of more or less use to reduce the pressure of the cerebral spinal fluids, and by this means localized headaches and nausea may be mitigated. These drugs should be given in rising doses to the verge of toxic endurance. Headaches are relieved by the coal-tar analgesics and opiates. It is a questionable service to unduly pro-

long the life of such sufferers, and yet we are certainly not justified in withholding any reasonable means for relieving distress.

ABSCESS OF THE BRAIN.

Abscesses are occasionally found in the brain of children, superficial or deep, or in either hemisphere; more often in the white matter. They generally arise from suppurative process in the middle ear, and on the same side as the affected ear, although it may be on the opposite. The symptomatology is extremely obscure. The search for a cerebral abscess is a most uncertain quest and postmortem they are not seldom demonstrated to the surprise of all concerned. In the more acute conditions we have the ordinary symptoms of sepsis, chilliness, fever, emaciation, along with the symptoms of cerebral tumor, headache, convulsions, vomiting, giddiness, along with local tenderness of the scalp, and occasionally optic neuritis. The temperature may be subnormal; there may be paralysis, which is apt to be of one side.

The treatment is chiefly prophylactic, by giving especial care to the prompt and thorough treatment of ear diseases. Early operation has occasionally brought about satisfactory results, and should always be hopefully considered, although there has little yet been done to justify expectations based upon these, so far, theoretic views.

INFANTILE SPINAL PARALYSIS.

Synonym.—POLIOMYELITIS ANTERIOR ACUTA.

Acute anterior poliomyelitis, myelitis of the anterior horns of the spinal cord, atrophic spinal paralysis, infantile or the "essential" paralysis of infancy, etc., is an acute febrile disease of probably infectious origin and rapid development, producing extensive paralysis, some part of which is permanent, followed by muscular atrophy, imperfect bone development, and deformity.

Causes.—The majority of cases occur before ten years of age; three-fifths before four years; it is rare before six months, but in the second six months susceptibility is greatest. Heat is shown by Sinkler to be a powerful predisposing factor; four-fifths of the cases occur in summer, mostly in July and August; Sachs asserts that seventy-

five per cent. arise between July and October. A rapid chill of body also has been shown to excite the onset of the disorder, a condition which may occur as well in hot as in cold weather. Fevers of various kinds are often blamed, but the diagnosis of the symptomatic initial fever can seldom be differentiated from those ushering in the infectious or other inflammatory processes. Slight injuries are reckoned as adequate causes by some, but all such histories need to be rigidly sifted. A specific cause of microbic kind is almost certainly behind the accidental ones.

Poliomyelitis represents an acute inflammatory process of the anterior gray matter of the cord, and the only satisfactory explanation of this is to assume an infection which tends to select a location in the cord.

Pathology.—Poliomyelitis is admitted to be an acute inflammatory condition of the anterior gray matter of the spinal cord. It is assumed, on good grounds, to be due to an acute infection which shows a predilection for the cells of the spinal cord, just as other acute infectious diseases choose their customary sites. All the clinical facts point to a microbic cause, but this is not yet proven, although the fact that it has appeared epidemically further strengthens the assumption.

Goldscheider's studies lead to the reasonable conclusion that a condition of irritation is present in the walls of the blood-vessels of the cord, leading to their dilatation and in the proliferation of their endothelial elements. Later degenerative changes occur in the ganglion cells as well as in the nerve-fibers appearing in the vicinity of the altered blood-vessels.

The inflammatory process is interstitial, not parenchymatous, and may be limited to a few segments of the cord, or extend to the medulla and pons. The muscles become atrophied, the fibers diminished in size, possibly disappearing, their places being filled by adipose tissue. The bones, too, become smaller and denser.

Diagnosis.—Poliomyelitis in the earlier stages may be readily confounded with acute cerebral disturbances, as meningitis and apoplexy. In meningitis, however, there is vomiting, rigidity of the neck, headaches, and affections of the cranial nerves. In poliomyelitis these do not appear, and convulsions and coma are brief. In acute cerebral palsy, well pronounced, the differences are clear, but

if less marked difficulties arise. The phenomena of onset are much alike, but the clinical features are in strong contrast.

ACUTE SPINAL PALSY.

Onset sudden, with fever, coma, and convulsions. Convulsions rarely repeated after first few days.

Paralysis flaccid, associated with atrophy.

Paralysis widely distributed, possibly involving all extremities, or narrowly limited to one member or even a single group of muscles.

Electric reactions altered (R. D.).

Deep reflexes diminished or lost.

Intellect never permanently involved; no epilepsy.

ACUTE CEREBRAL PALSY.

Onset sudden, with fever, coma, and convulsions. Convulsions apt to be repeated.

Paralysis spastic; no atrophy; associated with rigidity and contractures.

Paralysis generally hemiplegic, sometimes diplegic or paraplegic. Monoplegia rare.

Electric reaction normal.

Deep reflexes exaggerated.

Intellect often involved; epilepsy frequent.

—(*From Sachs.*)

Between poliomyelitis and peripheral (multiple or simple) neuritis the diagnosis is often difficult. In both the onset may be sudden, but is more slow in neuritis as a rule.

There is less evidence of general nervous disturbance in neuritis usually, but where this is the result of a distinct toxin the poison may produce cerebral phenomena very like those symptoms in the early stages of poliomyelitis.

Pain along nerve-trunks is more pronounced in neuritis and of longer duration; but the degrees of this are hard to determine in small children. Atrophies, electric reaction and reflexes may be the same in both. Muscular dystrophies may be mistaken for poliomyelitis and it for them, especially the peroneal form of progressive muscular atrophy (Charcot-Marie type). Atrophies are more progressive, are bilateral, slow to progress, do not retrogress, and have incomplete electric reaction.

Symptoms.—Acute poliomyelitis comes on suddenly without distinct prodromes, much in the manner of onset common to the acute infectious diseases with fever, vomiting, sometimes convulsions, and rarely coma. All these may be so slight as to escape notice until the motor disabilities are manifest. These symptoms last a few hours or days and gradually subside, leaving the paralysis. There is often tenderness along the affected nerves. The palsy is of the flaccid kind,

like all those depending upon lesions of the second division of the motor tract, and includes the ganglion cells in the anterior horns, the anterior nerve-roots, peripheral nerve, and the muscle. This is associated with atrophy in the affected parts. The electric reactions are altered almost from the first. The reflexes are diminished or lost. The fever is seldom above 103° , and more often is very slight. It lasts for a day or two, but in severe cases of this disease may continue with variations several days. Vomiting is quite a constant feature, occurs early, and is independent of gastric disturbance; often projectile, resembling that which occurs in cerebral disease. The convulsion, a by no means constant phenomenon when present, is general, not localized, as is usual in acute brain troubles. There is sometimes well-marked tenderness along the nerve-trunks, and even pain on passive movement of a limb, giving rise to the suspicion of a neuritis and making the diagnosis somewhat troublesome. This was common to several of the cases in an epidemic of poliomyelitis seen by one of us, occurring in August of 1896, in Cherryfield, Maine. The diagnosis between the spinal and cerebral types of paralysis can oftentimes only be made in the light of subsequent phenomena, the form of palsy, the electric conditions, and the atrophy. The palsy at first is extensively distributed and may involve all four extremities. This subsides rapidly, and those parts which are to be permanently damaged remain obviously impaired. The atrophy of the muscles is seen sometimes as early as the third day and often in the first ten days. The wasting is in the line of distribution of the loss of power, and a limb or muscle is readily seen to be smaller, even in fat subjects, than the corresponding parts. It feels limp, flabby, and cool, with vasomotor changes in the skin, occasionally a notable cyanosis and other evidences of inactive nutrition. The weaker muscles are at the mercy of the stronger ones; thereby contractures are produced. Shortening takes place, too, because the atrophy involves the bones also. The skin frequently appears shriveled, becoming pallid, cold, clammy, and bluish. The blood-supply is lessened, being no longer needed to the full amount, and the vessels themselves suffer shrinkage. The electric reactions are most important. The paralyzed muscles and nerves exhibit the reaction of degeneration, the anodal closure contraction being equal to or greater than the cathodal closure contraction. At the very first (Sachs) the faradic and galvanic response

may be increased soon to be lessened or lost ; the rule is, that reaction to the faradic current is lost at once, but to galvanism it remains or is increased for some time and then is lost, except that it may appear to very strong currents. If response to very strong faradic excitation is retained we can be hopeful of restoration to fair functional power. If this be absent for a long time the power of these muscles is gone. In the later stages, also, of the disease, if there is a return of faradic response or a normal behavior to galvanism, this enables one to predict, at least, a partial recovery. The restoration to power or size is never complete, although an excellent functional activity may be regained. We know of one man, a prize-fighter of fair success, too, of exceptional activity on his legs, who has had a localized palsy involving the muscles of the calf, with a slight contracture (varus).

The reflexes are diminished, at least those associated with the normal function of the paralyzed part. The knee-jerk is lost in the majority of cases ; but if the disturbance be in the upper cord it may persist, and also, if an isolated muscle or group of muscles only are affected. If all the muscles in a limb are palsied it hangs entirely limp, like that of a doll (the punchinello leg). The gait of a sufferer from poliomyelitis, where one leg is entirely flaccid, is thoroughly characteristic, and is much like a person walking on an artificial limb. Where there is only one or a few muscles affected the gait may be altered very little, and if the bone growth be not interfered with such persons enjoy great activity and are only impaired somewhat in power. The disablement is not nearly so great as in the spastic type of cerebral palsy, where the usefulness of the limb is disturbed by lack of control of what are often vigorous muscles. Permanent overaction is shown by the contraction of the strong muscles, causing the weaker ones to give way, offering no balancing opposition. Pain may be present from the very first but does not last long. Usually there is some tenderness along the affected nerves. The bladder and rectum are not involved as a rule. The brain is not affected at all, except possibly for the first day or two, and poliomyelitis leaves no mental defect whatsoever.

Prognosis is not so bad as is generally estimated, for while a palsy certainly remains it may be very slight and not disabling or seriously disfiguring. The more widely distributed the paralysis at first the more serious is likely to be the damage. The severity of the onset is

not a significant index, and those cases beginning most explosively recover surprisingly at times.

In the first few weeks little or no change may be expected, but if no improvement is noted in a muscle or group of muscles after two or three months, the outlook for improvement therein is gloomy.

If the palsy be ever so severe and yet respond fairly to electric contractions much may be hoped for of betterment. When the response to faradism can with difficulty be elicited, yet if this soon returns hope again arises. If this reaction be long absent, the muscle is liable to remain permanently paralyzed; more probably so if the reaction of degeneration be present. Life is rarely endangered, and to this extent the outlook is always good. If death occurs it is in the earlier weeks. Moreover, the mind is rarely or never affected; no fear need be entertained of mental degeneration as always threatens in the cerebral palsies.

Treatment.—Absolute rest and quiet is needed in the acute stage of this as of other inflammatory disorders, and the attention may be focused upon antipyresis and mild revulsives—the less medicines the better, except to meet symptoms as fever mixtures—aconite, liq. ammon., acetatis with ammonium bromid, or antipyrin. Salicylates may be useful for pain and muscular tenderness. Ergot is of value to limit the spread of inflammation. The bowels should be well opened by small doses of calomel, a saline, or castor-oil.

After a time the damaged muscles demand treatment; gentle massage is early indicated in short seances, superficial at first; later, faradism strong enough to contract the muscles—cautiously, and finally galvanism.

Faradism is of use as a muscle tonic if the parts respond to it at all to induce action which the will can no longer effect; if not, then galvanism must be used without delay. Frequent tests with faradism are useful to determine progress, and this it is always useful to employ along with galvanism whenever it produces contractions.

Massage, gradually increased, is of undoubted value to aid nutrition, circulation, and reactive powers in muscle and skin; this overcomes tendency to contractures. Skilled manipulators are needed for this to secure any satisfactory results. Passive movements should be employed in all cases to prevent the constantly menacing contractures.

Chronic changes, contractures, and the like should receive the most

careful attention from the orthopedist. Tenotomies are often followed by brilliant results. Splints, too, are of great assistance and must not be unduly delayed. Prevention of contraction is thoroughly feasible and far better than the overcoming of it after deformity has become established.

ACUTE MYELITIS.

Myelitis is an inflammation of the substance of the spinal cord, characterized by disturbances in the motor, sensory, and trophic centers.

Causes.—Myelitis may occur as a complication of the acute infectious diseases, rheumatism, exposure to intense cold, or sudden changes of temperature when the subject is overheated or exhausted, and to atmospheric conditions. It has been known to follow metallic and other chemic poisonings and overexertion; pressure of any kind, such as fractures, dislocations; and to arise secondarily to disease of bones of the spine, Pott's disease, and the infectious fevers, neoplasms, hemorrhage, and pachymeningitis. Very slight injuries in some instances seem to cause severe myelitis.

Course.—The onset of myelitis, as a rule, is rapid, and complete paraplegia is often established in a very few days. A complete recovery is rare. Cases may cease to progress after a fortnight or so, and never reach any serious condition of disablement.

Symptoms.—The symptoms of acute myelitis vary with the site of the lesion and intensity of the process; and the clinical features depend upon the amount of cord-tissue involved. The two forms of myelitis which are common in children are those which are due to syphilis and to pressure or extension from Pott's disease of the spine; the temporary palsies of rickets and scurvy are similar. In the syphilitic form and those due to slowly developed pressure there may be seen, occasionally, prodromes, such as slight disorders of sensation and intermittent weaknesses. A sensation of great weight in the legs may be experienced; in a few hours these may become quite useless, and in a few days entirely palsied. Convulsions and delirium have been seen but are not common. Pain in the back and limbs may occur if the posterior nerve-roots are involved.

The upper limit of the lesion is often marked by a zone of hyperesthesia, or of a sensation as of a girdle drawn tight about the body;

and below this the paralysis can be easily detected. Lesions occurring in the cervical region involve the ciliospinal center with consequent dilatation of the pupil. Complete transverse myelitis, at whatever level the area of inflammation may be, is exhibited by initial pains, numbness and tingling in the limbs, within a few days disturbances of motion; the reflexes are altered, and if the lesion be in the lumbar region, control of the bladder and rectum is disturbed. Paraplegia is the characteristic form of paralysis.

In myelitis occurring in the cervical portion of the cord, the paralysis of the upper extremities will be of a flaccid order; the paralysis of the lower extremities will be spastic in character. Anesthesia will be present in the four extremities and in the trunk to the level of the diseased segments; pupillary symptoms, unilateral blushing (due to lesion of the sympathetic), and paralysis of the diaphragm are present in some cases. "If the lesion is in the lumbar portion of the cord, the paralysis is restricted to the lower extremities and will be of a flaccid character, with more or less atrophy. If the lesion is in the cervical or dorsal portion of the cord, and the lumbar portion is entirely free from disease, the paraplegia of the lower extremities is of the spastic order; and the reason of this can be easily understood if we recall the fact that after a transverse lesion of any portion of the spinal cord the lateral columns will degenerate downward from that level, and that such degeneration of the lateral columns in the presence of normal gray matter of the lumbar segments will produce a spastic form of paralysis with rigidities and contractures" (Sachs).

Alterations of sensation begin from the start; areas of anesthesia will afford some clue to the situation of the lesion. At the upper limit of the area of lost sensation a zone of hyperesthesia may be found; above this normal sensation appears. In other cases a girdle sensation marks the level between the normal and the diseased segments.

The state of the reflexes helps us also to determine the area involved. We quote from Sachs again: "If the lesion is in the cervical region, all the reflexes of the upper extremities are lost, those in parts below will be exaggerated. If the lesion is in the dorsal region, the reflexes connected with these segments, such as the abdominal and epigastric reflexes, will be lost and the lower reflexes will be increased. If the lesion is in the lumbar region, the knee-jerk will be lost and the ankle

clonus will be absent also. In some cases in which there is a very narrow band of inflammation these reflexes may behave differently and may give one a direct clue as to the exact extent of spinal inflammation."

It is common to find exaggerations of reflexes along with spastic contractures of the legs. Electric reactions vary according to the segments involved. The reaction of degeneration will be found in most of the muscles of the upper extremities in cases of cervical lesion, while those in the lower extremities are unaltered. In lesions of the lumbar segments degenerative changes follow muscles supplied by nerves coming from the diseased area. In the muscles of the lower extremities the reaction is normal in cases of cervical and dorsal myelitis. The centers controlling the bladder and rectum are profoundly disturbed, resulting in retention of urine or overflow dribbling, and in retention or loss of control over the rectal sphincter. Priapism is sometimes an annoying symptom, as are also involuntary spasmodic twitchings, the latter resulting from very slight sensory impressions. A slight touch may cause a large contraction of the entire limb. Bed-sores are formed from the very smallest causes and must be assiduously guarded against in every way. Fever occurs in every form of acute myelitis, but may be complicated by other causes present. The most important point to determine is the cause. In the absence of other known origin slight traumata may be suspected; mere concussion may suffice. Those instances due to pressure, such as of tumors, tubercular deposits, syphilitic infection, and Pott's disease, are very distinct and have been alluded to.

Pathology.—It is exceedingly difficult to explain why the structure of the spinal cord should be so extremely liable to inflammatory disease, and why the dorsal portion should be more frequently attacked than the cervical or lumbar enlargements. The gross appearances, seen postmortem, show the cord to be surrounded by hyperemic meninges, and the cord itself congested or swollen. The cord substance may be softer than normal, or even reduced to a creamy pus which flows out readily. There may be minute hemorrhages or red softening, and every degree of change between this and such a degree of extravasation of blood as obscures all other changes. Microscopically, there may be seen dilated blood-vessels with leukocytes, granules of myelin and corpora amylacea, and axis cylinders in various stages of

disintegration. Whether fibers that have been once seriously altered can ever recover is open to grave doubt, yet in a fair number of cases recovery is excellent. Conservative vicarious action of remaining normal fibers probably accounts for this functionation where part of the cord is destroyed.

Prognosis.—Naturally, the higher up the myelitis the more is it likely to be dangerous to respiratory and cardiac centers. The perils in all cases arise chiefly from the complicating condition, particularly vasomotor disturbances, bladder and kidney involvement. If the myelitis be due to syphilis or a moderate toxic infection or slight pressure from a curable Pott's disease, the possibilities for recovery are good. The lessening of anesthesia is a fair index of improvement, and deep bed-sores beginning early is almost a fatal sign.

Treatment.—The treatment for myelitis is much the same as that for meningitis; the main objects are to avoid complicating conditions and to relieve the diseased organs of all strain. The first requisite is absolute rest, on a water-bed if possible. The bowels should be purged by calomel best, which also acts as a valuable diuretic. Some form of extension should be used from the first; we have devised a very simple measure for this, consisting of a towel folded lengthwise, to about three inches in width and pinned with two safety pins at the ends, making a ring large enough to just slip over the head; this adjusted under the chin and back of the head and caught on the two sides opposite each ear by a piece of bandage, forming a loop of, perhaps, two feet in length, extending to nearly the head of the bed; there to meet a piece of small rope and to hang over and down, and become attached to a weight, such as a flatiron. This is a very simple device, and yet has again and again proved a very efficient one, and can be made by careful readjustment to act even better than an expensive apparatus. Counterextension if required is easily obtained by elevating the head of the bed. The diet should be chiefly of milk and soups and other substances suited to inflammatory states, bearing in mind the vulnerability of the bladder. The water should be drawn by catheter, but excessive care should be used to avoid producing the ever imminent cystitis. Should this last occur, the bladder should be washed out two or three times a day with sterilized water or with boric-acid solution. A very important point is to make sure that the nurse allows no wrinkling of the bed linen on which the patient lies, who, no longer defended by

acute cutaneous sensibility, and the tone of the anesthetic areas being lost, easily suffers serious trouble to his skin. Should bed-sores begin to form, carefully adjusted antiseptic dressings should be used at once. Dusting powders are here of use,—acetanilid, thymol diiodid, aristol, and the like. Where the urine dribbles away, instant care should be taken to catch it in some vessel, or, perhaps better, ample masses of borated absorbent cotton or antiseptic gauze. Medicines are of doubtful utility except for symptomatic relief, such as digitalis, acetate of potash, or other diuretics and diluents; the iodids are useful in syphilitic cases and may assist in eliminating inflammatory exudate; especially are the iodids useful in the subacute stages of the malady, and should at least be tried repeatedly, unless found disturbing to the digestion. Should these be unavailing, inunctions of mercury may be substituted with good effect. Electricity is of little use to the spinal cord, but is valuable for the paralyzed muscles. Massage may be tried more hopefully and should be used just as early as is feasible. By this means cod-liver oil may be rubbed in and thus aid nutrition daily. If involuntary contractions complicate the case, as is only too common, the person giving massage must use slow, firm strokings, and gentle overextensions, which have a tendency to overcome this trouble. Strychnin must be used cautiously and is not so safe a remedy as is generally thought. Immediately convalescence is well established, every effort should be made to secure as much fresh air as possible. This should be done quite early by using additional coverings, especially over the head, and opening wide the windows, which is the next best thing to getting outdoors. Of especial importance here, too, is tonic treatment for the skin in the way of baths, hot and cold douches to the spine, adding salt to the water, aromatic vinegar, or the aromatic sulphuric acid. Counterirritation over the spine in prolonged mild cases of myelitis may greatly ease pain and exert some favorable influence on the inflammation.

DISSEMINATED SCLEROSIS.

Disseminated, insular, or cerebrospinal sclerosis is a disease of early life, characterized by a definite set of symptoms consisting of tremor, difficult deliberate speech, ocular symptoms, and a peculiar gait, but with great variation in the phenomena. Anatomically, areas

of sclerosis of varying sizes are scattered through the brain and cord.

Causes.—Disseminated sclerosis in children occurs most often as a sequel of the infectious diseases, after traumata, overwhelming emotion, or possibly following metallic poisoning. It is more common in adolescents, and yet not rare in children. It is much more likely to arise in those of neurotic heredity.

Symptoms.—The disease usually begins by a gradual weakness in the arms, fingers, and legs, with irregular pains and stiffness and an intention-tremor, gradually increasing. This tremor subsides when the parts are at rest, is seen upon effort, and grows worse under coördinate acts and excitement. It often increases in intensity and extends to the legs, producing great difficulty in locomotion. The articulation becomes deliberate, "scanning speech," pronouncing each syllable slowly and laboriously, like a child reading from a primer. There may be a distinct vibratile quality of the voice. The tremor at times affects the muscles of the eye, producing a nystagmus which is increased by looking forcibly to right or left; the field of vision is narrowed, the color-fields altered, quite similar to the changes produced in hysteria. The tongue, upon protrusion, exhibits a tremor also, and the expression of the face becomes stupid and uncertain. The mental condition, especially memory, is impaired, and the sufferer is exceedingly emotional, especially when the disease has begun early in life.

The paralysis is of the spastic order, showing in the gait a draggy, shuffling, springy motion of the legs (causing the shoes to wear through quickly in the toe part of the soles) due to rigidity and contractures. Athetosis is not uncommon. The deep reflexes are increased and the muscles become rigid. These phenomena may remain much the same for a long period, and yet tend to finally grow worse. The memory weakens, speech becomes unintelligible, and finally all the voluntary activities fail; sensation is little affected; death usually occurs from some intercurrent disease.

Pathology.—In disseminated sclerosis there are found plaques of sclerotic tissue distributed irregularly throughout the greater part of the central nervous system. These patches of firm, gray tissue appear in the brain as well as in the spinal cord, and may appear first in the one or the other. Whether the hardening shows in the nervous centers or in the nerves emerging from them, the character of the changes is much

the same, the important point to keep in view being that only some, and not the majority, of the nerve-fibers are destroyed, thus producing the perverted action of the whole cerebrospinal system.

Prognosis.—Multiple sclerosis is a chronic disorder, and induces death more by depreciating the entire organism and by adding an element of peril through increasing susceptibility to disease, than by itself terminating life. If the vital centers are affected death may be caused by this process directly. The progress is slow and quite incurable, but may in some instances come to a standstill for years. We have had under observation a family of many children in whom three, and possibly four, are affected by this disease, and from a very early age. One of these, a boy, served us in the capacity of errand boy for some months. They are all still living, though the oldest sufferer, aged about twenty-three, is now bedridden.

Treatment.—The disease is quite incurable, but many measures are of distinct value in enhancing the comfort of the sufferers. Prolonged rest, with systematic measures, benefits exceedingly. The process is very exhausting to the victims. There is a perpetual unrest which needs to be met by unremitting reparative measures. Sleep is oftentimes much disturbed and tepid baths at night contribute largely toward general contentment. Cool and colder douches are useful during the day, or the drip sheet, the patient standing in warm water. Electricity is of little use to the muscles—the constant current is valuable applied to the spine. Mild galvanism, moved up and down the back, may be tried most hopefully. Manipulations of the limbs will do much toward relieving the contractures. It should be borne in mind that in giving massage to spastic limbs, slow, firm movements are best; also, as demonstrated long ago by Mitchell, overextensions of the limbs tend to overcome contracture, lessen tremor, and make the parts more supple.

Medicinal.—Iodids and mercury have not the slightest effect, but arsenic is recommended, and a prolonged course of nitrate of silver may be tried. For the tremors, bromids, hyoscin, hyoscyamin, gelsemium, and belladonna exert some relief.

If contractures are extreme, and especially if they impede locomotion by malposition of feet, tenotomy may greatly aid in getting the patient to move about with more comfort.

HEREDITARY ATAXIA.

Hereditary ataxia, known also as **Friedreich's disease**, is a form of spinal hardening, appearing usually in children and with distinct hereditary features. It is to be recognized by a wide-spread ataxia, beginning in the legs, by impairment of speech, and nystagmus. The course pursued is a progressive one. There are many symptoms which, while sometimes absent, yet assist in giving a definiteness to the diagnosis. The cause is a very striking one of hereditary transmission during several generations. This may be in the same form, or by analogous scleroneurotic diseases. The susceptibility increases in the later generations, and those attacked are progressively younger. The defective development is rendered conspicuous by this,—showing, or seeming to show, that portions of the nervous system, especially the spinal cord, are incapable of sustaining their normal action and undergoing sclerotic change. Sometimes it is transmitted more from one sex than the other in one family, but in the next instance the reverse appears; the histologic changes in the spinal cord are pretty much the same as those which occur in locomotor ataxia. The symptoms are those of profound awkwardness with a tendency to fall upon slight provocation. The knee-jerk is lost very early as a rule; in certain cases, however, this is increased. The superficial reflexes are present or absent about equally. Sexual power is lost soon or late, hence descent in the male line is rarer. Romberg's symptom (standing unsteady or swaying with the eyes closed) is usually present, and more marked by an exaggerated sway or total inability to stand, and this progresses steadily; after a time the upper limbs and neck become involved, rendering the patient helpless and losing control of the head. Speech is likewise modified by the loss of all muscular power. Nystagmus is usually present, although not constantly, and must be watched for. There is little or none of the sensory disturbances seen in locomotor ataxia, or very slight. The power of the muscles is much reduced, but actual paralysis comes on very late and is of only moderate extent. Sometimes coarse tremor is present, amounting to choreoid movements of the head and legs. The face has a somewhat characteristic expression, looking heavy, with dropped jaw and mouth partly open. The course of the disease is chronic, death resulting from intercurrent maladies. Some cases have lived to considerable

old age, and others have only been discovered in their later years.

The **diagnosis** is made upon the youthfulness of the patient, slowness of the onset, the family history showing similar cases or instances of spinal sclerosis and predementia or direct features of the ataxia, nystagmus, peculiar halting speech, and to a certain extent facial expression. The pains of locomotor ataxia are absent, also the peculiar pupillary symptoms of that disease.

The **treatment** is altogether unsatisfactory. Those measures recommended in locomotor ataxia may be used, and general tonic and nutritional measures are demanded. Above all, much solicitude should be exercised to afford a reasonable amount of instruction, so that these unfortunate beings should possess some source of amusement or occupation through their long and miserable existence.

PROGRESSIVE MUSCULAR ATROPHIES.

An interesting group of disorders are the muscular atrophies. Some of these are peculiar to childhood and less rare than has been for a long time believed. The important point to make clear in each case is whether it be due to spinal origin or simply a muscular degeneration. The muscular atrophies of spinal origin are called *amyotrophies*; those of muscular origin *myopathies*. The term *dystrophy* has been restricted to primary muscular wasting.

PSEUDOHYPERTROPHIC MUSCULAR PARALYSIS.

This myopathy is a disease of early childhood, characterized by progressive loss of power in certain muscles and groups of muscles, which increase in size and yet are actually weak. Atrophy of the affected muscles finally supervenes.

The general symptoms are those of increase in the size of the muscles affected and clumsiness, the child falling readily and getting upon its feet with great difficulty. The muscles of the lower limbs are those chiefly affected, but certain muscles of the arms also are involved at times, those of the hand and forearm especially. The attitude is very characteristic, the legs are always held wide apart and the trunk very erect with the back usually hollow, amounting often to

a lordosis. The gait is a slow, wide-sprawling action, the feet being put down with great deliberation and the balance laboriously maintained. One of the most characteristic signs of the diseased condition is the maneuvers executed by the child in rising from the floor and getting upon its feet. This is as follows: The child lying upon its back rolls over on its side with more or less difficulty, and having straightened out its hands and feet in the position of "all fours" commences with great straining action to finally struggle to a position in which the knees are extended; then, watching its opportunity, it seizes one of its knees with the corresponding hand, throwing the head back, and catching the other knee with its corresponding hand, and then straightening the body.

The tendon-jerks as a rule are unaltered, except that they exhibit a greater feebleness and are finally lost. Sensation is impaired, also the mental activity as a rule. There are often slight vasomotor disturbances shown by a mottling of the skin of the legs. The cause of the malady is admitted to be hereditary influence in most instances, and always through the mother, who herself may show no evidence of the disease but transmits this developmental defect. While recognized after puberty has set in, it is reasonable to assume that the disease was in evidence before that time.

Pseudomuscular hypertrophic paralysis is now generally conceded to be primarily a disease of the muscles, an idiopathic myopathy.

The **pathology** of the disease is obscure,—a degenerative change in the muscular tissue itself, a trophoneurosis. Along with this, or following soon after, is a change in the connective tissue, which is both infiltrated with fat and increased, and to this is attributed much of the hardness.

The **diagnosis** of this condition is not at all difficult when once the overdeveloped muscles become well marked. If this phenomenon has not become conspicuous, the peculiar attitudes in lying and rising will give pretty complete evidence of the disease whose main features depend upon the weakening of the muscles involved in those acts. It is well described, in brief, as a slow and tedious climbing up the legs. Chronic neuritis is accompanied by fibrillary contractions and the reaction of degeneration, both of which are absent in this disease. It seems scarcely possible that spastic paraplegia could be confused for pseudomuscular hypertrophic paralysis, and yet this has occurred.

In the spastic condition the strength of the muscles, usually with wasting and great exaggeration of knee-jerk and the presence of ankle clonus, makes a conspicuous contrast. The prognosis is altogether unfavorable, but those who are cared for best will live the longest. Treatment is merely symptomatic and tonic. Systematic massage continued for many months has markedly improved several cases under our observation. Electricity is of less service.

CHAPTER XVII.

THE ACUTE INFECTIOUS DISEASES.

TUBERCULOSIS.

Tuberculosis is a specific, infectious disease due to the presence of the bacillus tuberculosis (Koch), and characterized by the formation of small nodular bodies in one or more organs. It is met with in nearly all parts of the globe, and is more destructive to human life than any other one disease, causing about fourteen per cent. of all deaths more than the aggregate from all the commoner infectious diseases including Asiatic cholera and leprosy. Tuberculosis is now almost universally regarded as contagious, infectious, or both, and prevails not only in man but in many animals, and may be acquired by inheritance, inhalation, swallowing, and by inoculation. While to other contagious and infectious disorders there may come an acquired immunity, there is a tendency in tuberculosis to steadily and rapidly progress. The presence of the bacillus tuberculosis in whatsoever secretion or tissue of the body is an infallible indication of infection by the disease and there is practically no limitation to its extension. Infection does not necessarily mean the establishment of a progressive and fatal disease. In many cases a natural and spontaneous cure is effected, favorable conditions for the development of the disease not being present or continuously maintained. There may also occur spontaneous arrest, even after the symptoms have declared themselves, the process becoming quiescent under favorable circumstances. It is probably not so prevalent or so deadly among children in this country as in Europe.

Causes.—The direct and exciting cause of tuberculosis is the tubercle bacillus of Koch, which gains entrance into the system (1) by direct transmission (parental); (2) by inhalations, dried sputum floating in the air, dust being a collateral medium of contagion; (3)

through infected milk and meat of tubercular cows and food-animals ; (4) through kissing, especially where the practice prevails widely between families and friends.

Lehman reports a case of congenital tuberculosis. The tuberculous mother died, three days after the birth of her child, of tuberculous meningitis, the child living but twenty-four hours. In its spleen, lungs, and liver were found nodules resembling tubercles, and containing



FIG. 25.—TUBERCULOSIS OF THE LUNGS DEVELOPED DURING TYPHOID FEVER.

tubercle bacilli in large numbers. Birch-Herchfield reports a similar case.

Tuberculosis is extremely rare in the new-born and uncommon in the first three months of life, increasing in frequency toward the end of the first and during the second year. It is also often met with from the third to the fifteenth year. Among children its seat is more commonly in the bronchial glands, lymph-nodes, lungs, and bones ;

it is also found in the pleura, brain, stomach, intestines, the large viscera, heart, and skin.

Certain individuals among animals and men are more susceptible to tubercular poison than others. This susceptibility may be inherent or acquired. Some races of both animals and men exhibit a marked predisposition to this disease, which among these individuals is propagated with great readiness and develops with extreme virulence. Among races and families in whom there may be no general predisposition, there are occasionally seen individuals who are distinctly more receptive or less capable of resisting the infection than others; and since the time of Hippocrates people of a certain type of body, as described by him, are believed to be prone to tuberculous disorders. This is especially true among children in whom classic types of conformation are recognized,—the tuberculous, with thin skins, long, slender bones, light hair, bright eyes, and oval faces; and the “scrofulous,” with chunky figures, dense, muddy skins, thick lips, heavy features, and large bones. Certain organic defects seem to render their possessors more susceptible, such as a contracted thorax with limited respiratory capacity, small and feeble hearts, narrow arteries, and relatively large-sized viscera. Certain local conditions in children are potent predisposing causes, such as catarrhal conditions of the throat and upper air-passages. Also, dilatation of the bronchi and existing pleurisy, disease of the stomach and intestines, especially where there is long-standing enterocolitis. Tuberculosis in children is especially liable to follow the infectious diseases, particularly measles, whooping-cough, and influenza. Various depressing causes lower the resistance of the individual to this poison, among which syphilis, typhoid fever, and small-pox are prominent; also chlorosis and anemia, along with malhygienic environment, nutritional depravity, and inherited vulnerability of tissues.

Hereditary predisposition, a powerful factor in the transmission of tuberculosis, may be regarded as a constitutional quality, a “type of tissue soil,” which favors the development of the disease in case accidental infection occurs. Congenital tuberculosis is very rare and in all the reported cases is directly maternal, no evidence being adduced that a tuberculous father can directly transmit the disease (Osler). The children of tuberculous parents most frequently exhibit the disease, but are thus constantly and intimately exposed to infection. Where-

ever the individuals are restricted in the matter of fresh air, sunlight, and exercise, there is greater prevalence of tuberculosis. Local epidemics of this disease have been described, and in Philadelphia, in certain wards of the city, it is particularly prevalent, especially in certain infected or badly situated houses (Flick). The air breathed out by tuberculous patients is considered harmless, but a large danger exists in their sputum, dried and pulverized and scattered about. Food is a common but perhaps exaggerated means of tuberculous infection, especially the milk of tuberculous cows, rendering it absolutely essential that systematic sanitary inspection of all animal foods should be rigid and constant. It is not certain whether the milk of a tuberculous woman is virulent or not; happily the mere swallowing of tuberculous milk, cream, butter, or meat is only a relative danger, other conditions being necessary for infection, whether local traumatism or merely a marked susceptibility. Certain general conditions strongly influence infection, especially environment. The disease prevails in crowded centers where contact among individuals is more direct, along with many devitalizing influences, among which severe or prolonged nervous strains are important, and restricted opportunities for movement and change. The situation of the house, the common living rooms, the soil, cold and dampness, elevation, and the like, are potent factors in tuberculous propagation. The rule in infancy is infection through the respiratory tract shown by the common distribution of the primary lesions (Northrop). Infection through the alimentary tract is much less certain or frequent. In both these situations some lesion of the mucous surfaces is necessary for ready acceptance. Even then the bacillus when lodged in the adjacent lymph-nodes may there remain inert. Treves and Holt maintain that tuberculosis of the cervical lymph-nodes is rarely a source of further extension of the disease, though Jacobi makes much of the latent danger of spread from this source. Inflammation and acute febrile conditions may, however, stir this up and cause havoc.

GENERAL TUBERCULOSIS.

Tubercular infection is oftentimes most puzzling in its onset and course giving a wide variety of symptoms, at first vague and ill-defined, and only later, and not then always, showing distinct evidence of localized disease. Each case gives rise to some peculiar

features depending upon the avenue and direction of the infection, the degree of resistance in the tissues, constitutional peculiarities, and the like. The general febrile process thus masks the local disturbance which may escape recognition altogether or be only shown post-mortem.

In infants the symptoms are often merely those of a general wasting, a marasmus; the subjects are pale, thin, slowly losing weight, and finally dying of exhaustion. As a rule, there will be a fever recognizable, possibly much higher than suspected when the thermometer is used, but seldom regular in course or above 100° or 101° F. Slight pulmonary signs appear toward the end, not well marked or in themselves significant; or these may become pronounced, especially dyspnea and cough. Again, the symptoms point toward lesions of the digestive tract, vomiting, and diarrhea; and these may be due to the constitutional disturbance rather than local infections of the organs disturbed. The diagnosis in babies under a year can only be made by the course of the disease and knowledge of probable tubercular infection, exposure to older folks who suffer from the malady, inheritance, or adequate inference from collateral conditions, infected food, etc. In older children the symptoms are those of a continued fever with protracted and indefinite symptoms, each one insignificant but collectively convincing. The subjects are generally feeble, ill-developed, hypersensitive, lacking in vigor, subject to catarrhal or dyspeptic states. Typhoid fever is closely simulated, barring spots and splenic enlargement. Always there is the wasting cachexia; often there are meningeal symptoms.

TUBERCULOSIS OF THE LUNGS.

The lungs and bronchi are most commonly affected by tubercular processes producing pretty much all varieties of pulmonary disease. The subject to be now considered is those states of tubercular involvement where the most conspicuous disturbances are observed in the lungs, producing the clinical features of an acute or chronic pulmonary disease. Two groups of cases may be separated; the rapidly destructive process, acute tuberculous bronchopneumonia, and a slower chronic form accompanied by ulceration, called chronic pulmonary tuberculosis.

Acute tuberculous bronchopneumonia is common in children from the

sixth month to the fifth year, and is the characteristic and most frequent form of tuberculosis in early life. It is peculiarly liable to follow the acute infectious diseases, especially measles and whooping-cough. It is, also, often a consequence of whatever conditions, acute or protracted, have profoundly lowered the general health. Inflammatory disturbances about the upper air-passages, active catarrhal or obstructive troubles, seem to markedly predispose to the development of tuberculosis, and it may be the terminal process in persons affected by local tuberculous trouble elsewhere. The pleura is usually involved also; occasionally there results empyema. Both lungs are involved, as a rule in different degrees. The upper lobe of the lung is more often affected than the lower, and especially that part near the root in the region of the bronchial glands.

Morbid Anatomy.—The essential lesion at first is bronchitis. The tubercle bacilli, lodged in the terminal bronchioles, excite a proliferation of the fixed cells, accompanied by the production of epithelioid and giant-cells which frequently contain the bacilli. This epithelioid element acts as an irritant, becomes surrounded by leukocytes, chiefly polynuclear, forming a translucent, gray mass, the tubercle of Laennec. At the margin of the tubercle a network of fibers is formed from the connective-tissue matrix. The tubercle undergoes changes which are in the nature of caseation and necrosis, with the presence of the specific bacilli and others (Prudden), as the streptococcus and staphylococcus.

Caseation.—The bacilli excite a coagulation necrosis beginning in the center of the tubercle and spreading to the periphery, convert the tubercle into a yellow, cheesy mass so common in tuberculosis. At this stage the mass may undergo (1) softening, (2) encapsulation, (3) calcification, or (4) sclerosis. In the first the softened mass may break into a bronchial tube and become expectorated, leaving behind an excavation with ulcerating surfaces; or (2) being encapsulated by the overgrowth of connective tissue undergo (3) calcification, or (4) necrosis with increased growth of fibrous elements, ultimately ending in the conversion of the tubercle to a hard, firm structure. In some instances a simple bronchopneumonia precedes the tuberculosis; especially is this true where the disturbance follows upon measles, whooping-cough, or other infectious diseases.

“In cases of tuberculosis, consecutive to bronchial pneumonia, we

find the lesions of two sorts: Simple inflammatory, non-tuberculous, such as peribronchial suppuration, dilatation of the bronchi, lesions of the alveolar epithelium, and peribronchial and peri-alveolar sclerosis; then, in addition, there are the true tubercular processes, peribronchial nodules, tubercular infiltration, and caseous areas" (Mosny, quoted by Osler).

Again, sometimes the tuberculosis is established before the bronchial pneumonia sets in, especially where tuberculosis is latent in the individual, and a bronchial pneumonia arises from whatsoever cause. "This is," again to quote from Mosny, "a bronchopneumonia dependent upon pneumococci or streptococci, invading the lung already the seat of local tuberculosis." Once the process of softening is established in children it usually proceeds till the life of the patient ceases. The bronchial lymph-nodes in such cases will be found tuberculous and a chain of these may be seen to lie along the greater bronchi. Periods of arrest occur with subsidence of the physical signs, cell-organization proceeding to produce fibrous walls acting as barriers to the advancing process.

Symptoms.—There is little or nothing in the earlier stages of tubercular bronchopneumonia to distinguish it from the simple form; the physical signs are the same. The disturbances of the apex are of no importance as a distinguishing feature, because in children the tubercular process may begin at the base or center, and the closest examination of the lungs may reveal little or nothing characteristic. The most valuable indication of the special nature of the trouble is in the course and progress of the disease, which exhibits great irregularity in the temperature range, and marked evidences of rapid loss of strength. All this is far more significant in a little child than in an older person in whom several factors combine to form such a picture. Emaciation soon becomes conspicuous, sweats, oftentimes profuse, accompanies, and the gravity of the disorder becomes obvious from many things, producing a suggestive syndrome. Cough may or may not be present.

In protracted tubercular *bronchopneumonia* the signs of consolidation manifest themselves, involving, it may be, a whole lobe. This proceeds to caseation, softening, and cavity formation. In the acute cases the duration is about a month. It is rarely possible in children under seven to secure expectorated matter in which to exhibit the

bacilli; and yet it is a constant matter for surprise how extensive tubercular disease may be present with little or nothing in the physical signs to evidence the fact. Cavities can rarely be demonstrated, though small ones exist having ragged or irregular walls.

CHRONIC PULMONARY TUBERCULOSIS.

In very young children tuberculosis shows itself in the lungs as a widespread generalized process involving other organs as well, or as a bronchopneumonia. In older children of seven or eight it resembles the chronic tuberculosis of adults. The lesions in children are much the same as those in adults,—miliary tubercles, peribronchial nodules, caseous masses, areas of softening and of fibroid thickening, and cavities of various sizes. The parts attacked first are not necessarily near the apex, as in adults, but may be at the base or center. The disease spreads directly from the deeply seated glands, either in the lung itself or along the trachea and about the bronchi. Occasionally considerable area of caseous pneumonia are found; small cavities are frequently met with, but large ones very rarely. A tubercular bronchial pneumonia frequently gives origin through the disturbance of the smaller bronchioles to a peribronchial alveolitis. There are also seen caseous masses, gray tubercles, infiltrations and dense fibroid thickenings, and irregular cavities near the roots of the lungs; one or both bases become semisolid from caseating pneumonia, or similar states arise at the apex. The pleura are affected, producing empyema, etc. The liver, kidneys, and spleen exhibit caseous masses, likewise the mesenteric glands and ulcerations of the intestines. Tubercles are found in the peritoneum and meninges of the brain.

Symptoms.—As in the adult, the general features of oncoming pulmonary tuberculosis in a child are those of marked pallor, gastric disturbance, loss of flesh, and of steadily failing health. The phenomena are far less clear and distinctive in children. Along with this is loss of appetite, rarely extreme; slight chilliness which may indicate fever, and malaria may be suspected. Some cases follow upon recurring bronchitis along with nasopharyngeal catarrh. There is nearly always a hacking cough, at first dry and short, by and by looser, usually in the morning, sometimes with more or less sputum occurring during the day or at night, and occasionally paroxysmal, like whooping-cough. Young children do not expectorate; yet if over ten or

twelve years of age they may do so, and the sputum is merely mucoid at first, and in the later stages it becomes purulent. Hemoptysis is rare in children; fever is always recognizable. This, along with progressive feebleness, acceleration of pulse, and a slight, regularly recurring cough, should always excite solicitude. The fever itself in the earlier stages is remittent, ranging between 102° and 104° . When the disease becomes more extensive the temperature has the quality of hectic, in the morning normal or less, while in the evening it may reach 104° or 105° . Chills are rare, but toward the close profuse sweats are common. Difficulty of breathing may be present from the first, due in part to the fever or to extensive bronchitis. In other cases, as in grown people, there may be little or no dyspnea with widespread destruction of the lung-tissue. Tenderness on percussion over the affected areas is often observed in children. The digestive organs are frequently involved, and not seldom a persistent diarrhea indicates tuberculous ulceration. Albuminuria is more or less common in the later stages. General anasarca in a child should suggest tubercular complications involving the internal organs.

Physical Signs.—**Inspection:** The chest is usually long and flat; the affected side may show limited movements with prominence of the clavicle, or in chronic cases flattening with depression of the shoulder. On palpation there may be discovered limited expansion and increased vocal fremitus. **Percussion:** There is little or no change to percussion in the earlier conditions, except, perhaps, if one apex be considerably involved; then there is dullness above and below the clavicle; supraspinous fossal flatness is rare. The cracked-pot sound is of no value in children. **Auscultation** may exhibit the various sounds of bronchial catarrh, alteration in respiratory sounds, and râles, moist and piping. The sounds heard in the chest are by no means a reliable guide as to the really grave element. The shallowness of the infantile chest makes it most difficult to estimate fairly differences in resonance. In children, the course of chronic tuberculosis of the lungs is much more rapid than in adults, and they rarely survive above a year. Occasional improvement may be seen with periods of high fever and rapid loss of strength. In rare instances chronic tubercular changes merge into fibroid conditions and a fair measure of health may be regained, enabling the child to live a number of years. It usually shows club-fingers under these conditions, a sign merely of chronic degenera-

tive change. Suspicion of tuberculosis should always be aroused whenever, in a child, progressive emaciation takes place with cough and hectic fever. Tuberculous bronchopneumonia is the condition found early, but the progressive character of the lesion may often be traced. Every effort should be made to secure some portion of sputum which will help to clear up the diagnosis. The recovery from tuberculous states in children is comparatively rare if once hectic fever is established. Tuberculosis may attack the pleura, usually secondary to existing disease in the lung. The pericardium is also occasionally involved; this is usually associated with tuberculosis of the mediastinal and bronchial glands. The kidneys and intestines also are not seldom found infected, producing albuminuria and disorders of digestion, persistent and recurrent.

Diagnosis.—Hectic fever, dry cough, persistent catarrh of the respiratory tract, diarrhea, emaciation, evidences of consolidation, are probable signs of chronic tuberculosis of the lungs. The discovery of bacilli in the sputum is the only positive diagnostic sign of the disease.

Prognosis.—The ultimate outlook is distinctly unfavorable, though the disease is not incurable. A family history of consumption adds much to the gravity of the outlook. When cases are seen early and placed under proper treatment, recovery may take place. Prognosis is bad when hectic is established, appetite poor, and the stomach not retentive.

Treatment.—*Preventive.*—Knowing that tuberculosis is an infectious disease and that children are exceedingly susceptible, prophylactic measures should be instituted with insistence and their observance both by the patients and members of the household emphasized. The consumptive adult who comes in contact with children should not spit promiscuously around about the house, or in the cars or public conveyances. Sputa of consumptives should be received in a suitable vessel containing antiseptic solution and afterward destroyed. Pieces of linen can be used for this purpose and subsequently burned. The healthy should not sleep in rooms occupied by those suffering from this malady. Kissing is to be positively prohibited. Cattle should be rigidly inspected, and all meat and milk of tubercular cows declared unmarketable. A consumptive mother should not nurse her child. The treatment of all varieties of tuberculosis in man resolves

itself into one plain proposition, and that is the maintenance of nutritive vigor; this object is discussed in another chapter at some length, and it is only necessary here to give an outline. It is a happy circumstance that this most widespread and prevalent disease is sometimes spontaneously, and oftentimes entirely, to be checked by suitable measures adapted to each case. The measures to be employed are: First, to live in the purest possible air and become inured to the changes of the weather, to get as much as possible of dry air and sunshine. The next thing is to secure perfectly good, abundant, and well-prepared food, and to digest and assimilate it. The staple diet should be nitrogen and fat; and, lastly, there is a series of nutrient tonics which have enjoyed the confidence of medical men since the earliest ages, at the head of which list stands cod-liver oil, to be taken one-half to three-quarters of an hour after meals, or when and how best suited to the stomach.

Special treatment of the tubercular process has never been crowned with any very remarkable success. The brilliant possibilities of Koch's Tuberculin have not yet been realized, but hope along those lines has never been altogether abandoned. Internally, creosote and its derivative guaiacol now enjoys the confidence of the medical faculty. From its use some excellent results have been obtained. The use of nucleins, too, by reinforcing leukocytosis holds out glittering promises.

The influence of creosote seems to be that of a general nutritive stimulant, lessening the fever, promoting tissue elaboration and digestive vigor, and in other ways, not clearly shown, producing favorable results. The dose for a young child is from $\frac{1}{2}$ to one minim, steadily increased to as much as it will bear, the index of endurance being the tolerance of the stomach. A convenient method is to put creosote in capsules or pearls, which children can readily be taught to swallow, or mixed in with some simple elixir, of which the very agreeable fluid preparations of pepsin and pancreatin, now on the market, serve as excellent menstrua. It is usefully administered in the form of inhalation. Guaiacol is well tolerated dropped on a lump of sugar or into an elixir. None of these highly volatile substances should be made up in a mixture of a perishable nature and allowed to stand. They are better dropped into the menstruum immediately before using. Hypodermatically, guaiacol is used along with sterilized olive

oil in a five per cent. solution. Other balsamic substances have been used by various authorities with good effect.

It is an exceedingly nice point to choose a suitable climate for the sufferers from the more active forms of tuberculosis, and while the more distant places, difficult of access, enjoy the most classical reputations, nevertheless there are places comparatively near by each one's home where the local conditions are all that are actually needed, provided great care be exercised in the selection of the house site. For instance, there are to be found sheltered valleys, especially upon hillsides looking to the south, surrounded preferably or fringed by evergreens, where a close observer will note a quality in the growing plants which testifies to salubrity. The building of a little cabin here will oftentimes afford very nearly all the advantages to be had in remote and well-known health resorts, with few of their disadvantages. It is not necessary, nor is it even desirable, for children to be dragged to the ends of the earth at great expense and infinite trouble and sacrifices on the part of their parents, when all the essential conditions can be partly found and partly provided at small expense, and under intelligent guidance be procured somewhere near their homes. The one thing essential to those predisposed to tuberculosis is a life in the open air during the best part of their waking hours. The needful conditions can be found in an acre or less of ground through which they can range and play at will. In suitable weather they may venture further abroad and thus enjoy a needful variety. The treatment of more acute tubercular conditions, as where fever has set in, can be accomplished far better within easy reach of home than in the more remote health resorts. Here the open air is most essential, also, with opportunities for swift retreat to a solarium, or a large, well-warmed room, when the weather changes. The fever itself is most obstinate and serious. Local cold, as by sponging, is the best means of reducing this, as it serves the additional purpose of acting as a powerful tonic. For hectic and sweating, astringents to the skin, aromatic vinegar, or aromatic sulphuric acid is useful sponged upon the skin. Internally this last may be given along with *nux vomica*. *Picrotoxin* checks sweating admirably well in small doses, gradually increased, so does the hydrobromate of *hyoscin*. *Agaricin* and zinc oxid in pill form have been highly recommended to check sweating. For the relief of cough the various preparations of opium have never yet been surpassed. The old-

fashioned paregoric is here still supreme, or McMunn's Elixir, or the derivatives of opium, especially codein or morphia. External applications are oftentimes most comforting, occasionally poultices for their heat and moisture, or medicated in various ways; the addition of laudanum serves a good turn, or a poultice made of hops. Tubercular diarrhea is a serious symptom requiring the prompt use of astringents, as lead, tannin, gallic acid, sulphuric acid, and the like. Various aids to digestion are usually indicated, the mineral acids, pepsin, or the newer forms of a compound nature, peptonzyme, protonuclein, or the nucleins. A well-prepared form of cod-liver oil, if it be made from the fresh livers and free from rancidity, such as Stone's Cod Oil, is a great help to many forms of digestive disturbance. This may be given in capsule, small amounts of a good article sufficing; or a sound oil may be put in the form of an emulsion at home with a fresh raw egg, and a little glycerin or honey, with the addition, it may be, of Jamaica rum or other spirits, the whole shaken together in a stone or amber-tinted bottle to defend from the light, and used up in a few days.

In dealing with tubercular conditions, prevention is much the most important part of treatment; this involves not only preventing the contamination reaching the individuals, which is to be done by zealously guarding them from all sources of infection, but whenever tubercular glands are recognized, these should be promptly and thoroughly removed surgically. In children so predisposed, the utmost pains should be taken to rear them hygienically, and particularly to guard against and cure all catarrhal affections. They should be especially encouraged to take and assimilate fat and to be guarded during their convalescence from contagious diseases.

DIPHTHERIA.

To do justice to the subject of diphtheria at the present time when views upon its etiology, essence, and treatment are varying so widely, would require an amount of space and time out of all proportion to other diseases.

This article, while somewhat irregular in shape and perhaps excessive in length in a small manual, seems warranted in view of the enormous importance which the subject at present assumes. We are upon the verge, it may be, that we have practically reached knowledge of the

disease and the means of controlling it, which shall revolutionize the study of diphtheria, and relieve the anxiety which bears heavily upon both the community and the physician, and open the way for discoveries which may be the foundation of both preventive and curative knowledge in other infectious diseases.

Definition.—Diphtheria is an acute, deadly, infectious, and inoculable disease, occurring sporadically and epidemically. It is characterized clinically by an inflammatory exudation upon the mucous membranes which occasionally attacks the abraded surfaces of the skin. This disease selects usually for its site the pharynx and upper air-passages; it also appears in the nose, and exhibits a marked tendency to spread to other parts, even to the utmost ramifications of the bronchi, and is attended with engorgement of the associated lymphatic glands.

Constitutionally, diphtheria is marked by irregular fever, pronounced debility, and is frequently accompanied by albuminuria. Death is brought about usually by toxemia, heart failure, or mechanical obstruction of the air-passages by extension of the fibrinous exudate. It is followed by a slow, irregular convalescence and peculiar forms of paralysis.

Causes.—Diphtheria is a germ disease caused by the activity of the bacillus diphtheriæ (Klebs-Löffler). Several microbes are found associated with this in the mouth and throat, among others the staphylococcus albus and aureus and the streptococcus pyogenes, which may themselves become active and complicate the disease. Certain harmless microbes may also be present and even accumulate in the lymph-vessels leading from the inflamed surface. Diphtheria is still regarded by certain authors as a constitutional disease, developing a local lesion at some period of its course. There is much evidence, however, in favor of the view that it begins as a local malady. The bacillus diphtheriæ was discovered by Klebs in 1883, and by Löffler in 1884, and because of their practically simultaneous discovery of the germ it is generally called the Klebs-Löffler bacillus. Inoculation into the lower animals produces the characteristic symptoms of diphtheria, which are the formation of false membranes with an underlying necrosis, along with paralysis and albuminuria. The bacillus produces certain ptomains or toxins which are absorbed by the lymphatics and blood-vessels and give rise to serious constitutional symptoms. The bacilli themselves are regarded as harmless, except for their power to produce specific

ptomains. The isolated toxin, if introduced in small, increasing amounts into the circulation of animals, produces an increasing degree of immunity. The serum of such immunized animals produces immunity in man. The action of the attenuated diphtheric virus when injected into man or animals destroys the toxins formed by the bacilli, but not the bacilli themselves. This constitutes a biologic antidote.

Diphtheria is common among certain of the domestic animals, particularly cats, also occurring in cows, pigs, and certain fowls, and may be inoculated into many more. Diphtheria is transmitted from animals to man, and conversely.

There is a disposition to believe that there are two varieties of diphtheria bacillus, the one virulent (pathogenic) and the other harmless (non-pathogenic). An innocent variety of diphtheria germ is often to be found in the pharynx of healthy children and others. False membranes appear upon the mucous surfaces from various causes, chiefly from irritation other than that of diphtheria. The habitat of the microbe when outside of the body is not yet clearly understood, but it is found in filthy surfaces, especially of human or animal refuse, and has a marked causal relationship to damp localities. Diphtheria is transmitted usually by direct contagion, although it is capable of transference by various other means, and is inoculable. Diseased or abraded surfaces are far more susceptible than healthy ones, and mucous surfaces are the usual site. The radius of contagion is limited to a few feet, and with reasonable precaution it is not dangerous to approach one so affected. Bad hygienic conditions, such as dampness, darkness, and the like, not only favor the spread of diphtheria, but lower the resistance of those who live under such devitalizing conditions. Direct contagion is proven to be not nearly so large a factor in the propagation of diphtheria as foul drains and filthy collections of animal refuse. Children are much more susceptible to diphtheria than older persons, but the disease may occur at any period; white children under five are most susceptible (Billings). The propagation is favored by cold and damp weather, bad hygienic surroundings, excessive exposures, and overcrowding. One attack does not confer immunity, but on the contrary seems to make one more susceptible to the disease. Diphtheria may accompany other diseases, especially acute disorders of the throat. Epidemics of diphtheria are apt to follow the prevalence of other contagious diseases. Diphtheria and

typhoid fever frequently prevail at the same time and in the same locality. Laryngeal diphtheria very frequently complicates measles, and is a most fatal sequel thereto.

Pathology.—In diphtheria the inflammatory processes are more commonly confined to the fauces, tonsils, and pharynx, although they occasionally extend to the nose, trachea, and bronchi. The morbid process in true diphtheria is excited by a specific bacillus, first described by Löffler and Klebs, and is characterized by the formation of a membrane associated with considerable swelling of the cervical lymphatic glands.

This membrane has at first a whitish, then an opalescent, and finally a muddy gray appearance; in the latter stage it resembles a necrotic portion of mucous membrane. This false membrane is very adherent, but when forcibly removed displays a hyperemic mucous membrane beneath, usually intact and only rarely, except on the tonsils, is there a tendency to ulceration. During the progress of the disease the exudate becomes quite thick and is composed of several layers of fibrin, the lower ones being the most recent in formation.

The fibrinous network contains within its meshes numerous epithelial cells, leukocytes, serous exudate, and diphtheria bacilli; the upper layers of the membrane also contain great quantities of cocci. The latter, however, bear no relation to the etiology of the disease. The mucous membrane itself shows inflammatory infiltration.

Symptoms.—The incubation period of diphtheria varies from two to ten days, according to the severity of the epidemic and the physiologic resistance of the patient. The symptoms are both local and constitutional. Mild and malignant cases develop near and from each other.

The prodromes of diphtheria resemble those of other infectious diseases, exhibiting slight chills, moderate fever, malaise, and some degree of pains in the back and limbs. In very mild cases these symptoms may be trifling, so that the patient is soon up and around. As a rule, fever in the first twenty-four hours of the attack may reach 102° or 103° F.; in severe cases the temperature may be subnormal. The course is quite irregular. The pulse is rapid and feeble, from 100 to 120 a minute; sometimes a drop of one in twenty beats occurs, and very frequently it is dicrotic. The first well-marked symptoms in a typical case are usually those of throat inflammation; the little patient com-

plaints of difficulty in swallowing, feels tender under the jaw, and somewhat stiff in the muscles of the neck.

The most characteristic feature is the constitutional disturbance with marked debility, which is out of proportion to the severity of the fever. At first the throat may show nothing, or be only hyperemic and swollen. Spots may not be seen at first, or begin as small, adherent patches, grayish or yellowish-white, usually upon the inner surface of one or both tonsils. These may at first be scarcely perceptible except as slight opacities, but the tendency is to spread, covering the tonsils and meeting in the center. There is little or no pain, or it may become severe. Weakness and pallor increase. The course of the fever is irregular. The heart early shows special enfeeblement, the breath becomes fetid, the tongue is usually coated and swollen. The appetite disappears, nausea may appear, and the bowels become costive. The glands of the neck are usually swollen symmetrically. The urine may grow scanty and high colored, or maintain a natural appearance with albumin showing in two or three days. In mild cases the symptoms subside in a week or ten days, the patient becoming much enfeebled, convalescing slowly; in severe cases the weakness grows extreme and the obstructive symptoms progress. If the nose is involved, there are the usual symptoms of obstruction, and the secretions excoriate the upper lip and emit an extremely offensive odor. The glands about the jaws and neck become enlarged and tender, especially where the nose is affected, sometimes involving the connective tissue, stiffening the whole neck. Where the larynx is first attacked, this usually begins on the third or fourth day, and is shown by hoarseness and obstructed breathing, with a peculiar croupy cough, and symptoms of cyanosis, with increasing dyspnea. The coughing up of bits of membrane may relieve this for a time, but the membranes soon form again and the trouble may return and become more urgent for relief. During the progress of this local disturbance the constitutional symptoms are liable to grow worse, with depression of pulse and circulation, and increase in the kidney complications, casts and blood-cells showing in the urine, and along with this is an extreme prostration. Death may result from suffocation unless the symptoms are relieved by intubation or tracheotomy.

The difficulty of breathing may be due either to increase in the amount of membrane, or from swelling of the false membrane, or the

detachment of a portion stopping up the glottis, or acute engorgement of hypertrophied tonsils already existing. Or else, on the one hand, the difficult breathing may be due to altered blood states, by reason of accumulation of waste matter in the blood, causing systemic depression by autointoxication with subsequent heart failure. On the other hand, the altered blood disturbs the respiratory center and thus causes dyspnea, or, finally, by accumulations of poisonous waste matter and consequent systemic depression, heart failure is induced.

Albuminuria is present in one-half the cases, usually appearing between the third and the tenth day; this may be due to acute nephritis or to the effect of the toxins on the glomerular epithelium of the kidneys or from imperfect aeration of the blood in the late stages of the disease.

Albuminuria is attributable to changes in the renal epithelium, the "acute degeneration" of Delafield. This change is brought on by the febrile state causing cloudy swelling of the epithelium of the tubules. The amount of albumin is slight and usually disappears by the subsidence of fever, or albuminuria may result from the circulation in the blood of abnormal and irritating ingredients. This malady rarely leaves serious kidney trouble behind it.

The pulse is nearly always rapid, and if it fall below the normal is a sign of serious cardiac weakness. Tirard says the chief characteristic of the pulse of diphtheria is its disproportionate rapidity as compared with the temperature. He also calls attention to the early loss of the knee-jerk in the first, second, or third day, and this is a valuable aid in diagnosis.

A certain number of cases assume a malignant type even from the very beginning, and the system becomes overwhelmed with the intensity of the poison; or the severity of the disease may show itself in excessive membrane formation. The average duration is about ten days to two weeks, but mild cases recover in a few days. Severe and protracted attacks of the disease may last for weeks.

The paralyses which follow diphtheria are due to trophic changes, and may be sensory, but are usually only motor. They are peculiar in many ways: One set of muscles may be losing their force while another are regaining, but all are likely to get well in the long run. The knee-jerks are usually absent, and there is little or no pain or tenderness. The part usually affected is the soft palate, which loses both power and

sensibility and also control over the acts of swallowing or speaking. The muscles of the eye are sometimes paralyzed; also one or both vocal cords; or, again, the diaphragm or cervical muscles, sometimes the sphincters of the bladder and rectum, and frequently the whole lower extremities. (See Neuritis.)

Diagnosis.—Certain specialists in diseases of the throat, and some who regard themselves as such, claim that they can differentiate between the simpler inflammations of the throat and the milder forms of diphtheria. To a limited extent this is true, but such diagnosis is not to be relied upon. The bacteriologic demonstration of the Klebs-Löffler bacillus, which now can be secured with great promptitude and more or less thoroughness in all of our larger and in many of our smaller cities, is the most reliable guide. The only decisive method, as claimed with much justice by Runge, are control-experiments in the way of animal inoculations. In the concealed forms of diphtheria, as in the trachea or the nares, the difficulties of diagnosis are large. The differentiation between croup and diphtheria is clinically very widely separated, although in certain instances the diphtheria bacilli are demonstrated in the membranes of croup. Moreover, croup is a local disease, albuminuria is absent, the lymphatic glands are only rarely enlarged, and no paralyses follow. In croup the necrotic change is more superficial. Scarlatina exhibits a sore throat closely resembling diphtheria, although the two diseases may coexist. The scarlatinous throat is said to be much more diffusely red than in diphtheria, and in well-marked cases this is certainly true. There is also the characteristic tongue. Streptococci are found in scarlatinous throats but not the bacillus diphtheriæ.

Prognosis.—The vigor of the individual is little or no guide as to the likelihood of recovery. Where important organs are seriously damaged, the case is more desperate. Paralyses may arise as readily in originally strong as in weaker children. The severity of diphtheria varies considerably in different epidemics, but at any moment septic conditions may arise in even the mildest cases, ending fatally. The earlier the treatment,—it matters little what plan is used,—the better the prognosis. The quantity of membrane is no index of the severity of the disease. The laryngeal form is liable to be fatal from mechanical interference with breathing. Where diphtheria involves the nose, danger is great, because of the greater vascularity and abundant lymphatic

vessels there which readily absorb septic material. Scrofulous children succumb readily to diphtheria, and so do those convalescing from measles, whooping-cough, and scarlatina. The death-rate of diphtheria is from forty to seventy-five per cent., and until recently, despite all efforts to the contrary, this has remained about the same. Half the fatal cases are under five years of age.

Treatment.—*Prophylaxis.*—The most important point in the treatment of diphtheria is, without doubt, a thorough wide-spread popular knowledge of the subject, and its prevention. This will enable not only the medical adviser to limit the spread of the disease on making its appearance, but elicits the assistance and coöperation of the family and the community. Isolation of the patient should be prompt and complete, and maintained so long as the germs exist in the throat. The time of its disappearance may vary from a few days to—in one reported instance—seven months. One observer has shown that the germ persisted for forty days; the average is about fifteen days. Great danger may arise from a very slight case, whether it be recognized or not; and these mild, oftentimes unrecognized cases are likely to prevail when diphtheria is epidemic. The habit of promiscuously kissing children is pernicious, and contributes largely to the spread of diphtheria and other infectious diseases. Malignant cases are readily acquired from the simplest ones. All sore throats, when diphtheria is prevalent, should be isolated and carefully treated; all suspicious cases should be examined bacteriologically, and the greatest precautions taken, even when the diphtheria bacillus is not found; but where the streptococcus and staphylococcus are demonstrated, every precautionary measure should be employed, whether in families, schools, asylums, or hospital wards, and every suspicious case instantly set apart and guarded. If the disease shows itself in several instances in the same school, thorough hygienic measures should be pursued and the school closed for a sufficient time. In the event of death from diphtheria, the body should be wrapped in a sheet soaked in corrosive sublimate solution, and immediately placed in a sealed casket; the funeral should be strictly private.

A patient with diphtheria should be placed in a large room, free from all hangings, rugs, and unessential furniture, and kept quietly in bed. The temperature of this room should not rise above 68° F., and even in comparatively cold weather free ventilation should

be maintained, either by opening the windows or those in an adjoining room, if drafts are feared. An open fire is of importance for ventilation as well as warmth. In warm weather a lamp burned in a fireplace to cause an upward current of air is of value. The bed should be a single one, with opportunity to approach on either side. All discharges from the patient should be thoroughly disinfected. Clean cloths or absorbent cotton are to be used instead of handkerchiefs or towels, and everything promptly burned after using. No one should be allowed in the room except those immediately concerned in the care of the patient, and such persons demand special treatment and strict quarantine. The physician, on entering the room, must be overclothed with garments upon both body and head, which should be disinfected thoroughly. He should also wash his face as well as his hands before leaving the room. The face-guard, such as described by one of us in the "Medical News," 1895, is of value to prevent particles of infection from being coughed into the face—useful both for physician and nurse. Those in constant attendance had better spray their own nostrils and throats several times a day with some cleansing solution. The crowding together of diphtheric patients in the same room or ward is to be deprecated, as it increases the virulence of the disease. Particular attention should be given to the throats and mouths of children, especially to the teeth and tonsils.

Local Applications.—In diphtheria these are of great value, and should be vigorously but carefully employed, though they must be of the blandest, and, of course, omitted in very young children and nervous ones who become alarmed. The objects of local treatment are to remove the toxalbumins and destroy the bacilli, to hasten the separation of the false membrane, and afford relief to the dyspnea arising from obstruction in the larynx by the exudate. Local applications are useful: First, as germicides; second, for cleansing purposes; third, to dissolve false membranes; fourth, to allay irritation. They should be applied warm and be unirritating.

The conclusions of Dr. A. Campbell White in determining how far the outlines of the membrane and the presence of the bacilli are influenced by local measures are as follows: (1) The prompt washing of the air-passages attacked by diphtheria lessens the duration and amount of the diphtheric membrane; (2) antiseptics of sufficient strength to be germicidal are irritating and cause extension and per-

sistence of the false membrane ; (3) they may cause systemic poisoning ; (4) spraying (also the pernicious treatment by swabbing) is inefficient, and by young children can not be endured ; (5) frequent cleansings of the throat and nostrils with a bland solution, as plain warm water, or normal salt solution, is easier of application, more agreeable to the patient, and accomplishes all that can be expected of any antiseptic solution. Löffler reports excellent results from the use of his so-called "Toluol" solution for the local treatment of diphtheria, and regards it as sufficient without other specific remedy. He claims a low mortality, general applicability, whether in true diphtheria or mixed infections, and absence of any injurious working, considerable prophylactic action in destroying at once the source for the spread of the disease, and, finally, its cheapness. This solution, as recently modified, is as follows :

Menthol, 10 gms. dissolved in toluol q. s. to 36 c.c.
Absolute alcohol, 60 c.c.
Liquor ferri sesquichlor., 4 c.c.

This is the best for true diphtheria when there is extensive putrefaction, as often occurs in cases of mixed infections.

The ferric solution may be substituted with advantage by two or three c.c. of creolin or one minim of creasol, absolute alcohol up to 100 c.c. This toluol solution will keep in dark-colored bottles with glass stoppers form onths. The method of application is as follows : Superficial mucus being removed by revolving over the membranes a large swab of cotton, a fresh swab carrying the solution is pressed firmly for ten seconds against the affected spot, and this repeated until the whole membrane has been treated. Since it is painful, it must be done thoroughly at the first attempt. This has given good results in the hands of many, used once or twice a day, seeming to check the spread of the membrane, and sequels are rarely observed. It is well to bear in mind that local pain follows the application of Löffler's solution, but this is less since the addition of the menthol. Guaiacol, applied in the same manner as Löffler's solution, possesses the same virtues, but has the same defects, causing pain on application. The use of cocain previously may alleviate this. A large number of local applications have been recommended, such as peroxid of hydrogen, pyrozone, hydrozone, mild solutions of bichlorid of mercury, etc. Jacobi rec-

ommends a spray containing one grain of corrosive sublimate to the pint, adding a dram (3j) of table salt. Saturated solution of borax and water is also cleansing, but common table salt, one dram to a pint, is more generally accepted. A solution of boric acid is used by the Germans. Various solvents for the mucous membrane are occasionally applied, such as pancreatin or papayotin, one to twenty in water. Any trustworthy cleansing solution will suffice. Applications to the outside of the throat are practically useless to the swollen cervical glands. Belladonna, iodoform, or ice-bags, however, assist in relieving pain. Ichthyol, 33 per cent., diluted with lanolin, is perhaps the best of external remedial agents, and ranks next to cold applications. Vapors of various sorts, turpentine, eucalyptus, and carbolic acid, sometimes employed, are of doubtful efficacy. Relief is often obtained by the use of steam generated in a croup kettle, and directed under a sheet, arranged like a hood over the patient's head,—always to be employed in intubation cases. Steam thus applied favors suppuration and aids in loosening false membrane, and is of special utility in the laryngeal forms. Excellent results are claimed by Flick, Judd, and others, in the local use of ealomel in powder, diluted or of full strength, especially in the nasal form, and wherever the membrane can be reached. A number of cases occurring in Flick's own family as well as in those of his friends have been most successfully treated by this means, along with the internal administration of ealomel in small doses, constantly repeated, $\frac{1}{120}$ to $\frac{1}{40}$ of a grain every fifteen minutes. This he regards as both a local and systemic measure. We have tried this treatment in three cases with very excellent and prompt effect. Very great care and judgment must be exhibited in the use of the local measures, especially lest the patient be alarmed or excited, and through unskilful manipulation the disease should be induced to spread, or ulcerated or denuded surfaces be thus created, which become avenues for the entrance of the disease elsewhere. Where the nares are nearly occluded by a thick membrane and secretions, they may be cleansed by a cotton swab on the end of a probe dipped in a bland cleansing solution, or, far better, by irrigation from a fountain syringe with soft-rubber nose-piece,—the child wrapped all about with a sheet to restrain the movements, lying on its side, face turned down, and a steady, gentle current run into the upper nostril, the solution coming out of the lower nostril by gravity. This may be

frequently tried until the solution, comes through and out of the lower nostril. Then the child is to be turned on its other side and the process repeated. If irrigation of the nose produces comfort and clears away the obstructions, it serves an admirable purpose. The normal salt solution, fifty-six grains to the pint, is probably the best. In some cases where the nostrils are completely occluded, a post-nasal syringe may be useful. Care should be taken, however, in practicing nasal irrigation, that too much force be not used or the solution may be forced into the Eustachian tubes, giving rise to much pain or great discomfort.

Constitutional Treatment.—The object of constitutional treatment is to combat the effects of the toxins, and the remedies used have been selected either empirically or rationally. It is hardly necessary to review the long array of medicines which have been offered for the purpose of combatting the essential poisons of diphtheria. Some of these still retain the confidence of many wise men and able observers. The internal use of small doses of calomel, as recommended by Flick, certainly deserves respectful attention. He gives $\frac{1}{120}$ to $\frac{1}{40}$ of a grain alone or triturated with a little sugar of milk, every fifteen minutes, combined with the local use of calomel, full strength or triturated one-third, insufflated every hour or two. His results are flattering, and, in the absence of the more popular and efficient remedy, antitoxin, the method deserves a careful trial. In the discussion of his second paper an important point was brought out, namely: That a large proportion of those who rely on antitoxin in the treatment of diphtheria use more or less calomel also in the majority of cases. Judd urges similar measures and purges his patients once well with the calomel. If serious evidences manifest themselves of destructive changes in the tissues, sepsis, etc., the whole dependence is to be placed on constitutional and nutritive measures and not on any specific agent. A powerful agency is the hypodermic use of strychnin in doses of gr. $\frac{1}{100}$ to gr. $\frac{1}{60}$, to a one-year-old babe, repeated every three to five hours as demanded. Feeding should be so full as to be almost forced. Alcoholic stimulants are needed when clearly indicated, but are credited by some of the best clinicians with doing much harm at times. The indications for stimulants are marked prostration, feeble pulse, dicrotism, and a weak first sound of the heart.

Disinfection.—When a child has been relieved from imminent

suffocation or has received an injection of antitoxin and placed in a position of relief, choose two rooms in the house, or, if this be impossible, one large room. This being clean and heated, preferably by a stove, remove the child to it without delay. The room vacated should be cleaned at once by burning from four to eight pounds of sulphur in it, previously closing all apertures, permitting everything to remain in it as found, and keeping the room thus closed from four to six hours. The efficacy of the sulphur vapor can be increased by the generation of a little steam in the room. It is then to be opened, aired, the floor and woodwork scrubbed with soap and water, and afterward washed with sublimate solution 1:2000, thoroughly dried, and the child returned to it, the same procedure repeated in the first apartment. Formaldehyd generated in a thorough manner is more efficacious than the sulphur, and is now in general use. The child should be changed from one room to the other day by day, so that while one is occupied, the other is undergoing the process of cleansing. Choose a room with a stove, to maintain constant temperature. On the stove place a large kettle filled with boiling water; add, once an hour, a tablespoonful of the following mixture:

Eucalyptol,	3 ij
Acid. carbol.,	3 ij
Ol. terebinth.,	3 xij.

The child should be washed twice daily, or oftener, and dressed in fresh garments. The nourishment and medicines are to be kept out of the room and only brought in when required. The furnishing is to be the merest necessities,—a bed, table, chairs, and stove. Rigid cleanliness should be enforced and carried out by the nurses. Ventilation should be of the freest, with caution; temperature of room, 68° or less; the windows kept open, or those in the adjoining room, constantly except in extremely cold weather.

Technic of Applying the Diphtheria Antitoxin.—First, choose the antitoxin. Second, learn accurately its strength. Third, learn how to apply it by carefully estimating the needs of the individual case. It is unnecessary to give an account of the various antitoxins used in America; there are a number of firms who manufacture this in a very satisfactory manner, and they are striving diligently to improve their methods and their products every day; also in the larger cities the

boards of health manufacture serums for their own use with the utmost care, most of which have been shown to be of excellent quality.

The strength of the serum is expressed in what are known as immunizing units. This denomination originated with Behring, whose original or normal serum was of such strength that 0.1 cm. of it would protect against the ten-times fatal dose of toxin when simultaneously injected into guinea-pigs. Each cubic centimeter of this normal serum he called an immunizing unit. Later, it was shown that the strength of the serum could easily be increased tenfold, so that 0.01 cm. of the serum would protect a guinea-pig against the ten-times fatal dose. Each cubic centimeter of this stronger serum was described as an antitoxic unit, and, of course, contained ten immunizing units. Still later it was shown that the limits were by no means reached, and he succeeded in making serums as much as three hundred times the normal strength, each cubic centimeter of which contained 300 immunizing units, or thirty antitoxic units, and at present antitoxin is made, each cubic centimeter containing 1000 immunizing units.

How to apply the antitoxin * consists, first, of the technic of application; second, the dosage. For the purpose of making the injection, any hypodermic syringe may be used if of satisfactory capacity. The one we prefer is a special syringe made for this purpose with a rubber packing, having a capacity of five c.c. and ten c.c. respectively, which can be measured accurately by a screw, so that the quantity used may be administered at one injection. This is supplied in a metal case which allows the whole to be sterilized in boiling water before and after using. A good veterinary hypodermic syringe is satisfactory. Another excellent syringe is made all of metal, the plunger fitting snugly, the barrel requiring no packing. The location chosen for the administration is usually in the back between the scapulæ, on either side of and near to the vertebral column, which, being in a sort of canal, is protected from pressure while lying on the back; some select the loins or sides of the chest. The skin should be thoroughly cleansed by means of alcohol upon sublimate cotton or gauze. Immediately after the injection the aperture should be closed hermetically with iodoform collodion. The syringe before each using should be cleansed thoroughly by means of very hot water. The whole operation should be

* Condensed from Rosenthal.

performed with conscientious aseptic precautions. We have never met with any local trouble due to the injection.

The Action of the Antitoxin.—“Experimental evidence, then, favors the theory that the antitoxin acts through the agency of the living bodies, and probably in the sense that it renders the cells tolerant of the toxin. It is not to be expected, then, that the effects will follow the injection of the serum with the same certainty and precision that is shown in chemic reaction. The cells must be in condition to respond in the proper way. For one reason or another this responsive power may be in abeyance; it may be weakened by intense or prolonged persistence of the diphtheria poison or by other previous or recurring diseases, or by inherent weakness, or there may often be some individual idiosyncrasy which hinders the response of the cells to the antitoxin. There is also the possibility that the antitoxin may neutralize the effects of certain toxins and not others present in diphtheria. Antitoxic serum exerts no bactericidal effects upon the diphtheria bacilli, though when administered in sufficient quantity early in the disease it arrests the spread of the disease, which is caused by the bacilli” (Welch).

Administration and Dosage of Antitoxin.—A large clinical experience with antitoxin has led to clearly defined and simple rules for its administration. A clearer conception of the therapeutic indications for the remedy and the recognition that there are absolutely no dangerous after-effects, and but few and rare disagreeable results following an injection of antitoxic serum in doses ranging from 1000 to 3000 immunizing units, have led to the employment of larger and still larger doses; and, where repetition is found needful, at much shorter intervals than were first recommended.

The importance of inaugurating serum treatment early, recognized from the first, has grown more emphatic by accumulating evidence. All statistics show that the earlier in the course of the disease antitoxin treatment (or any other treatment) is begun, the better are the results. The mortality in cases so treated, when the disease is in its incipency, or has just established itself, is practically *nil*; and in cases treated late, say from five to eight days, may range as high as thirty to forty per cent. The number of days the disease has apparently progressed is no absolutely reliable criterion of the stage of development in the individual case. This applies especially to the formative period, when the disease is

frequently more or less masked, and constitutes one of the several reasons why antitoxin treatment should be instituted at once in all cases which excite suspicion. In the clinical management of all such cases, and of all acute anginas, even remotely simulating diphtheria, a full curative dose of antitoxin is the means of gaining much valuable time and the saving of many lives.

Bacteriologic examinations are of totally inadequate clinical value if the serum injection is delayed to secure a report, since too much time is thereby lost in instituting specific treatment. Furthermore, such examinations are not conclusive independent of the clinical manifestations of the disease; and, again, the great majority of cases showing negative results in the laboratory yield equally promptly with others to serum treatment.

Antitoxin treatment, however, is of value even when given late, especially in the laryngeal variety. A thoroughly reliable serum administered at almost any period of the disease will materially lessen the mortality, only it must be accepted as a therapeutic axiom that the further the disease has progressed, the greater is the urgency for a large initial dose, and the necessity for repetition of the dose at short intervals—once, twice, or oftener (in the twenty-four hours), according to the severity of the case.

To be adequate, a curative dose of antitoxic serum must contain enough immunizing units to neutralize perfectly the specific toxins present in the system. When this is done, the system is immune to any further development of the Klebs-Löffler bacilli, and the disease is arrested. If the initial dose fails to accomplish this, the disease progresses in proportion to the degree in which the dose has fallen short, or no effect at all may be produced. The repetition of the dose or its increase is then instantly indicated, and the less time which elapses before such repetition is made the better will be the results.

The exact therapeutic indication, as far as concerns the number of immunizing units which should be administered in any given case, can not be determined, since there is no possible means of estimating the quantity and virulence of the absorbed toxins. Hence the imperative need of a sufficiently large initial dose.

Doses should invariably be estimated in immunizing units and not in quantity of serum, since the latter is only the vehicle. The most concentrated serum—that which contains the largest number of units

per cubic centimeter—is the most desirable product to employ, because of the small bulk of the dose, diminished irritation, its prompt absorption, speedy effects, and larger percentage of cures.

Immunizing doses need seldom exceed 500 units in adults, and 200 or 300 units for children, depending upon circumstances, degree of exposure, etc., and is operative for about one month; three weeks is the minimum (Morrill).

The fear once attending the administration of immunizing doses to any but the most robust children has been found groundless by Dr. F. G. Morrill's experience in the Boston City Hospital, as well as by many others. Behring's rule is to give 100 units to an individual of about 120 pounds body weight. Rosenthal gave 600 units to a pregnant mother, then in charge of her child suffering from diphtheria. She was subsequently confined in the same room without evil effects.

A *curative dose* should be 1000 immunizing units, and may be as high as 3000 or 4000 units as an initial dose. The age of two years should be the dividing line; below that, 1000 units are sufficient, above that, 1500 to 2000 units. This dose is frequently sufficient for many cases seen early. In well-developed cases showing more or less malignancy, in laryngeal cases, and in the nasal variety, no less than 2000 units should be given as an initial dose; this should be repeated in six, twelve, or twenty-four hours. The repetition should be in increasing quantities. Thus, if the initial dose be 1000 units, the second dose should be 2000 units, the third dose should be 3000 or 4000 units, and so on in increasing quantities until the characteristic reaction is obtained. In serum treatment the rule to follow is: Increasing dosage as the case progresses, and never a smaller dose than the beginning. Some operators give a large initial dose and repeat the following doses of the same amount. If these rules are followed, either the large initial dose, repeating the same dose, or the gradual increasing dosage, very few cases will require more than two doses.

In making the injection, the ordinary precautions are to be taken; this applies to the syringe and the site of the injection. The former is easily prepared by boiling, and the latter by the use of soap and water, or alcohol soaked on sublimated cotton or gauze. The injection can be made at any point of the body free from pressure,—the back, sides of chest, or groins; the interscapular region is to be pre-

ferred. The patient can not there witness the act, and will be less apt to experience fright.

Manufacturers have adopted different methods of describing their serums in commerce, and these in a measure shroud the strengths of the serum in obscurity. As the dose of antitoxin should always be given in units without regard to quantity, therefore it would be well for manufacturers to have the strength of each cubic centimeter placed conspicuously on the bottle. The contents would hardly be sufficient if it were necessary to divide the dose or otherwise modify the use of the remedy. To illustrate, Behring uses colored bottles and labels as follows:

- No. 0.—Yellow, containing 200 units.
- No. 1.—Green, containing 600 units.
- No. 2.—White, containing 1000 units.
- No. 4.—Red, containing 1500 units.

The quantity of serum in each bottle is not indicated. Aronson supplies two strengths:

- No. 1.—5000 units (100 units per cubic centimeter of serum).
- No. 2.—1000 units (200 units per cubic centimeter of serum).

Parke, Davis & Co. :

- No. 0.—250 immunizing units (white label).
- No. 1.—500 immunizing units (blue label).
- No. 2.—1000 immunizing units (yellow label).
- No. 3.—1500 immunizing units (green label).
- No. 4.—2000 immunizing units (pink label).

H. K. Mulford Company have adopted a different plan from the above. It is not only plain, but concise. They supply four different strengths known by specific names, and by standardizing their serums enable one to know precisely the number of immunizing units per cubic centimeter of serum. The following illustrates:

- Standard, containing 100 units per cubic centimeter.
- Potent, containing 250 units per cubic centimeter.
- Extra-potent, containing 500 units per cubic centimeter.
- Double extra-potent, containing 1000 units per cubic centimeter.

These grades represent different degrees of concentration, and the bottles are further labeled :

- No. 1.—500 units—(for immunizing purposes).
- No. 2.—1000 units—(curative for mild cases).
- No. 3.—2000 units—(curative for severe cases, etc.).

Clinical Manifestations of the Diphtheria Antitoxic Serum.—Antitoxin is manifested—

1. By its effects on the pulse and circulation.
2. By its effect on the temperature.
3. By its action on the diphtheric membrane.
4. By its specific action on the stenosis of laryngeal diphtheria.
5. By its influence on the duration of the disease.
6. As a substitute for the meddlesome and dangerous method of constant, local, and systemic treatment in vogue hitherto.
7. By its effect on the presence of the bacilli in the throat.
8. By its action as an immunizing agent.
9. By its influence on the mortality records.

1. *Effects on Pulse and Circulation.*—In the faucial variety antitoxin produces a very marked effect in about eight hours, reducing the tension of the pulse and circulation to normal, where it may remain, or again increase, in which event it is an indication for the use of more antitoxin. This is especially true where the toxemia is so profound that the temperature is very little above or often below the normal. In laryngeal cases the pulse-rate remains high throughout, especially in those intubated, and the indication is then for judicious collateral medications.

2. *Effect on the Temperature.*—The temperature is most profoundly influenced by the antitoxin in the favorable cases of simple diphtheria ; this decline is from any elevation to the normal, and remains. Should the fever recur, however, with no intercurrent disease, as of the lung, the indication is for an additional dose of antitoxin.

3. *The action on the diphtheric membrane* hereby affected is most marked, limiting its continuance oftentimes to twenty-four hours, forming a separation in from forty-eight to seventy-two hours, when the red line surrounding the membrane is once clearly seen, and over which Rosenthal asserts the membrane never spreads. There is then no further need for antitoxin.

4. *Its Effect on Laryngeal Diphtheria.*—(a) Cases not requiring operation. (b) Intubation cases.

(a) When used early in laryngeal diphtheria it prevents the spread of the membrane, averts asphyxia, and avoids the necessity of intubation or tracheotomy. (b) In intubation cases, antitoxin in a great measure prevents the need of intubation or tracheotomy. Where intubation is demanded, the time required for wearing the tube is much lessened, and tracheotomy is practically made unnecessary. Antitoxin has reduced mortality in cases of intubation from sixty-two per cent., before the serum was used, to about eleven per cent. Moreover, the time which the tube is worn has been reduced from an average of 185.25 hours to 116.25 hours—a reduction of sixty-nine hours.

5. *The Action of the Antitoxin in Limiting the Duration of the Disease.*—When administered early in simple diphtheria, all trace of the disease has often vanished on the third day. In the mixed contagion the infection is antagonized and the complications are to be treated without regard to the existence of diphtheria.

In the laryngeal form the stenosis disappears on the third day, unless an operation is demanded. Where intubation has been done, the tube may be withdrawn on the fourth or fifth day. In the majority of cases the improvement of the patient begins obviously and at once, thus lessening the probability of complications.

6. *As a Substitute for the Meddlesome and Dangerous Methods of Constant Local and Systemic Treatment.*—The specific action of antitoxin improves the condition of the patient rapidly, limiting the necessity for constant and meddlesome methods aforesaid. Persistent endeavors to remove the membrane are rendered superfluous by the specific properties of the antitoxin, exerted upon the origin and growth of the exudate.

Local applications are only needed for the purpose of cleanliness and ridding the throat of the specific organisms which may be a source of danger to others. The administration of food or stimulants need not be so frequent, and probably the alcoholic stimulants are needless,—in many cases they seem to do harm. Unfortunately, though the power of the antitoxin is great, it is by no means a cure-all, and complications may arise demanding prompt and ample attention, just as though the disease had ceased to be. Disturbances of the heart and lungs or kidneys must be treated alone, without regard to the precedent diphtheria.

7. *The presence of the bacilli in the throat* is not markedly affected by the antitoxin, and these persist long after convalescence, just as in other forms of treatment. It is important to make frequent test cultures to determine this fact.

Rosenthal, in experimenting with those substances which seem to exert the most marked effect upon the life of the bacilli, concludes that the toluol solution of Löffler (already described), and the chlorin and iron mixture given below have afforded him, so far, the best results:

R. Potassium chlorate,
Chloric acid, c. p., of each, 1 gm.
Tinct. of ferric chlorid, 5 c.c.
Simple syrup or glycerin, 120 cm.

8. *As an Immunizing Agent.*—The property of antitoxin to increase immunity against diphtheria has been verified by an enormous number of observers in institution work as well as in hospital and private practice. This immunity is not permanent or lasting beyond certain periods. Immunization is necessarily repeated at intervals of two or three weeks if the individual is continuously or again exposed.

9. *The Influence of Antitoxin on the Mortality Records.*—The mortality records in all large cities are now preserved with such care so that reliable conclusions are to be drawn thence. It has been shown without peradventure, taking all the various statistics into consideration, that the use of the antitoxic serum has enormously lessened the death-rate.

There remains, then, to consider one other important point,—the effect of antitoxin upon the various complications. If certain organs have begun to be damaged by the poison or where they were unsound previously, always difficult to determine, then the disease process may not be stopped by antitoxin. It is more than probable, however, that an early and adequate dose of antitoxin will check or limit the mischief thus begun or emphasized by the diphtheria. It must be borne in mind too that by the curative effects of the serum many cases survive to acquire complications, which had otherwise succumbed early. Dr. Dana has given us in the "New York Medical Record," of April 11, 1896, a thorough consideration of the subject of diphtheric palsies and the use of antitoxin. His conclusions are that, while the diphtheric palsies are not increased by the use of antitoxin, the fact

that they are not much affected nor stopped shows that the antitoxin, however effective as a whole, is not given in sufficient doses to prevent the specific effect of the diphtheria on the nervous tissues. Nevertheless, he admits that while the antidotal action of antitoxin is incomplete so far as the nervous centers are concerned, it is sufficiently powerful in a large number of cases to prevent serious destruction to the organism. Destructive changes are not to be influenced by any specific, but we depend for their removal and repair on rational and constitutional treatment and to the meeting of special symptoms.

Pneumonia is a serious and frequent complication of diphtheria in children. Nothing in the way of local treatment will avail in bronchopneumonia following diphtheria. Antiseptic vapors are valueless, as their germicidal properties can not reach the seat of disease in the terminal bronchi and air-cells. Inhalations of oxygen repeated frequently on demand by symptoms are useful, partly as heart stimulants and partly to reinforce the crippled lung. The cold pack is the best antipyretic. Sheets wrung out of ice-water and applied every half hour until the temperature is sufficiently reduced not only effect the fever, but stimulate the circulation and exert a local effect upon the lung, reducing congestion. Local heat and poultices are here valueless. In intubation cases it is a useful precaution to keep the foot of the bed raised a foot higher than the head to encourage the draining away of discharges. Drugs to affect the heart as well as temperature are to be used, such as ether, nitroglycerin, caffein, and alcohol. (See Bronchopneumonia.)

Complications and Sequelæ.—The most frequent and by far the most important complications and sequelæ of diphtheria are the various forms of paralysis. These occur much less frequently in children than in adults.

Paralytic symptoms may occur early in the disease, but usually come on about the third or fourth week, and are independent of the general condition of the child.

The intensity of the attack of diphtheria is scarcely ever an index of the extent or severity of the paralysis that follows; likewise, it is impossible to anticipate the probability of paralysis, or the severity of the palsy from the amount of membrane in any given case, for the milder forms of pharyngeal diphtheria are frequently followed by paralytic symptoms, and the proportion varies in different epidemics.

The commonest form of paralysis is that which affects the muscles of the soft palate and the muscles of deglutition; evidence of this form of paralysis is manifested by a nasal intonation of the voice, uncertain speech, dysphagia, and regurgitation of liquids through the nose.

Occasionally we have seen motor paralysis of the ocular muscles, causing strabismus and ptosis, also at times involving the muscles of accommodation.

Less commonly a multiple form of peripheral neuritis occurs. In most cases it begins with the muscles of the palate and those concerned in the act of deglutition, and gradually extends to one or more extremities, the degree of paralysis often varying in different groups of muscles.

The most serious form of palsy is that found in connection with the heart. Heart failure may occur at any time in the attack or during convalescence.

Albuminuria of diphtheria is not to be regarded as an unfavorable sign unless it is found in considerable quantity in the urine and associated with the more malignant forms of the disease.

The most serious complication involving the lungs is bronchopneumonia, as seen in young children. It is not, however, frequently encountered.

Pericarditis, endocarditis, and meningitis are rare, and are observed only in septic cases of the severer forms.

SCARLET FEVER.

Synonym.—SCARLATINA.

Scarlet fever is an acute specific disease, self-limited, and very contagious, characterized by sudden onset, vomiting, sore throat, and oftentimes convulsions, and accompanied by a high degree of fever and the appearance of a diffuse punctiform rash appearing first about the neck and shoulders. One attack protects from others with rare exceptions. It occurs in epidemics more commonly in autumn and winter, but is constantly endemic in populous cities. Some unexplainable reason would seem at certain times to favor the propagation of scarlet fever, causing those who have escaped previously to yield to the poison. The usual complications are membranous inflam-

mation of the pharynx, frequently extending to the nose and ear and occasionally to the larynx. The sequelæ have chiefly to do with nephritic and middle-ear disease.

Causes.—A specific micro-organism is suspected to be the cause, but this is not yet demonstrated though the complications exhibit the effects of the streptococcus pyogenes along with, oftentimes, other pyogenic germs. It enters the system most commonly through the nose or throat. It is by some regarded as a local disease of the throat followed by constitutional symptoms. The severity of the angina does seem to be an index of the general disturbance.

Predisposition plays an important rôle, individuals varying widely in this particular and the same persons at different times. Certain persons constantly exposed escape and long after readily contract the disease. Scarlatina attacks the most vigorous as readily as those of feeble constitution. Age is a potent factor in the propagation and mortality. Babies under six months rarely contract the disease, but those above one year readily do so, and among them the mortality is high. Incubation is from two to five days, more or less, but is rarely over a week. A short incubation presumes a severe case. The infection is transmitted not so readily as measles, but is exceedingly tenacious. Almost any object coming in contact with the sufferer from scarlatina may retain and convey it, especially those which have been much handled,—domestic animals, pets, flowers, books, clothing, etc., are vehicles,—and, indeed, almost any object may be the medium of contagion. The morbid principle remains active for months and even years. No age nor race is exempt. The exact origin of any outbreak is hence most difficult to trace. Milk is a recognized agent. The secretions of the patient are the most dangerous, in particular those from the mucous membrane and from the skin, and especially while in the stage of desquamation. This last is denied by some, but can not be ignored. During incubation the patient is scarcely able to communicate the disease, but so soon as the rash appears he is a source of danger, and more so when the disease is at its height and long after, indeed, till full recovery, not only from the febrile process but from the protracted desquamation and while any catarrhal or suppurative output continues. The feces and urine are to be feared, especially when there is nephritis or diarrhea during convalescence. Quarantine should be maintained until the child is completely re-

covered from the disease and the mucous membranes and skin show no trace of disturbances.

The skin lesion consists of hyperemia with dilatation of superficial vessels and infiltration about the sweat-glands. There is destruction of the lining epithelium, a filling of the lumen with granular detritus, and death of the epiderm which is cast off during desquamation.

Symptoms.—The premonitory symptoms, usually severe with vomiting, chills, fever, convulsions, angina, etc., are in some sense an index of the severity of the attack and promptly followed inside of a day or a day and a half by the rash. In serious cases the fever rises suddenly to 104° to 105° , rarely less than 101° , even in the mildest. The pharynx will early show some soreness, but there may be no objective appearances there, yet usually there is a marked redness over the fauces and tonsils consisting of a uniform blush or a series of small punctate spots less marked than in measles; at other times the throat resembles follicular tonsillitis or even a well-marked attack of diphtheria. These throat symptoms are not always obvious at first; more commonly they show a little later in the disease—two or three days—and tend to increase in severity to the point of much distress and greatly puzzle the physician. Diphtheria is suspected, but bacteriologic study seldom reveals the Klebs-Löffler bacillus—more commonly the streptococcus. The deep cervical glands are usually enlarged or soon become so.

The urine is generally lessened in amount and of higher specific gravity, deeper color, and shows frequently traces of albumen. After three or five days all these symptoms subside, as a rule, and the child becomes bright and active once more unless some complication impairs its vigor. It is imperative to keep it in bed, however, as exposure then is exceedingly perilous.

The tongue of scarlatina has been described as typically like a strawberry, that of measles like a raspberry. It is difficult to find such simple, graphic pictures, however, nor do they help materially in diagnosis. The tongue is commonly thickly coated with a white fur, which may show the fungiform papillæ through. Soon this clears off and may become glazed; then the fungiform papillæ persisting in prominent view there is a resemblance to the strawberry.

After the first evidence of disturbance the rash may appear in half a day to a day and a half, or even as late as the fifth, usually beginning about the neck and chest. It may come and go and at first escape

attention, and continues from three days to a week. In an epidemic we observed and reported, occurring in the Children's Hospital in 1878, of eleven cases, in none the rash lasted over a week, and one only a single day. The color is distinctly characteristic, a bright scarlet, resembling Rötheln, and not the crimson of measles, which is more purplish in tone. Color alone is a significant guide to one of keen color sense, but since one man in ten is bereft of this, and few men (though all women) possess the faculty, this depending for a decision upon comparisons of shades and tones is too often only a following of precedent, and not the product of observation. There are many irregularities in appearance and extent of the erythema; it may be absent altogether, or appear transiently one place to-day, another to-morrow, or may cover the patient from head to heel. The color tones are not constant, especially after the first few days, becoming occasionally purplish, or crimson like measles, and, also like it, macular, irregularly grouped, spotty; occasionally it is hemorrhagic. The typical scarlatina rash is found, on close inspection, to be a minute rosy blush around the sweat-glands in babies, in older children about the hair-follicles; these points are surrounded again by erythematous zones which, in the mass, convey a sense of the extent and uniformity. At the height of the eruption there occasionally appear miliary vesicles and "petechiæ."

When at the height, too, sometimes the rash recedes, "strikes in," producing a disturbance in the minds of the family and friends. This is rarely alarming; it may, however, indicate lowered vascular tension, weakened heart action, and is usually restored (both the rash and cardiac action) by a hot bath or pack. Secondary rashes indicate grave conditions.

Itching is sometimes annoying, but not so intense as in measles. As the rash develops, other symptoms increase and then lessen with its subsidence. As the rash fades, desquamation sets in; this consists of an exfoliation of dead epithelium, and the form is characteristic. Upon the body and limbs this is bran-like, dropping off in small scales; but upon the hands and feet it occurs in large masses or flakes so massive as to exhibit, now and then, complete "casts" of the fingers or palm, resembling the "slough" of the snake, and occupying from two to four weeks; on the hands and feet longer. If the surface has been anointed by soothing applications and regularly bathed, this is far less conspicuous or prolonged.

It is a common experience in dispensaries to meet cases of the various complications,—nephritis, otitis, and the like, in whom the disease has not been recognized at all till these later disorders arise. In our out-patient service we have seen many such. The mere appearance of this peculiar form of desquamation is practical proof of preëxistent scarlatina. Cases vary from the mildest, wherein the temperature is not above 101° F. to 102° F., a fugitive rash, slight pharyngitis, all subsiding in three or four days, to those of moderate severity, sharp prodromes, and well-marked symptoms, temperature 105° F., “boiled lobster” rash, longer duration five to seven days; and, finally, malignant cases, with short incubation, intense initial symptoms, early and full exanthem, higher and longer fever, severe and varied complications, intense angina, congestion and ulceration, sores on lips and teeth, cervical lymphadenitis with brawny cellulitis, fetid nasopharyngeal catarrh, and general septic symptoms. In these cases the temperature leaps up and remains high for a week or ten days. We had a notable case, a boy of twelve, presenting all these phenomena till the dyspnea and heart failure compelled us to abandon hope; the urine was loaded with albumen and growing scanty. Suddenly the urine became loaded also with uric acid crystals (which was beyond all previous or later experience in acid urines), and continued thus for two days, during and after which all the danger signals were lowered and the boy made a perfect recovery, and to-day, ten years later, is apparently in perfect health.

In severe epidemics there are met with rare cases of sudden overwhelming severity, “fulminating” or lightning cases, in whom death takes place before the ordinary symptoms declare themselves. There are usually evidences of cerebral disturbance, vomiting, convulsions, headache, and the like, followed quickly by evidences of organic failure and it may be of hyperpyrexia (107° F.).

Surgical scarlatina is a curious condition not well understood, wherein after slight or other operation scarlatina becomes inoculated. This is usually the case of accidental exposure in one not protected by a previous attack. The operation seems to render the subject peculiarly susceptible. This form of scarlatina is generally atypic; short incubation, non-characteristic rash, irregular but severe nervous phenomena are common. Some observers deny that these cases are aught else than peculiar forms of septicemia, but it is demonstrated

that from them scarlatina is often spread, and that the sequelæ common to this disease follow, such as nephritis and otitis.

The urine is generally lessened in amount, of higher specific gravity, and of a deeper color, frequently showing traces of albumin. As a rule, all these symptoms subside after three to five days, and the child becomes bright and active once more, unless some complication impairs its vigor. It is imperative to keep the child yet a while in bed, as exposure now is exceedingly perilous, and it is at just such times that future disastrous happenings are begun.

The kidneys are, next to the throat, most commonly affected—in the milder cases only temporarily by the appearance of febrile albuminuria, which is, according to Delafield, an acute degeneration of the kidneys, direct irritation of the epithelium of the tubules by the toxin eliminated by the kidneys.

The microscope shows a granular degeneration and death of the epithelium of the tubules. It is the appearance known as "cloudy swelling." This condition entirely clears up upon the recovery of the patient and calls for no further treatment than a continuance of fluid diet. Pronounced lessening of the amount of urine is of grave import.

Certain variations are oftentimes noted in the symptoms. The rash is sometimes nodular or papular, causing an appearance like "goose flesh," or, again, vesicular. It may come and go intermittently; urticaria sometimes coexists, or minute hemorrhages take place on the surface, causing an appearance of "blackness," or, rather, a deep purple; this is common in malignant cases, but not always. Congestive states or inflammatory disturbances of internal organs have a tendency to modify the character of the rash—lessening it, as a rule; hence the importance of keeping the skin abundantly active during the entire course of the disease and of using prompt counterirritation by means of hot baths, etc.

Slight transient paralyses have been noted (Meyer; Alexieff).

Diagnosis.—It is often exceedingly difficult to be absolutely certain of the diagnosis of scarlatina in less than two or three days or until the later phenomena appear. Notwithstanding the clear picture ordinarily exhibited of the short incubation, vomiting of onset, sudden and marked rise of temperature to 100.5° or 103° F., early appearance of erythema and angina, pronounced constitutional symptoms and

early appearance of albuminuria, etc., nevertheless there are other conditions which present most of these at times. The chief difficulties lie in the irregularities in the distribution and character of the eruption, whereas a typical scarlatiniform rash is occasionally due to other diseases, influenza,—rötheln, diphtheria, and also to the ingestion of certain drugs.

A careful review of the symptoms as hereinbefore given will suffice instead of repeating them here.

Complications.—The most prominent complications of scarlatina are observed in the throat. There is almost always present, as a constant factor, an erythematous blush, somewhat punctate, spread over the mucous membrane and hard palate, and upon the tonsils, which are swollen, and small membranous-looking exudates are seen on them, easily wiped off. When this symptom is severe, the appearances closely resemble diphtheria, so much so that many yet regard this state as a combination of the two diseases, but it is proven by bacteriologic studies to be due to the streptococcus, and only very rarely to the Klebs-Löffler bacillus (pseudodiphtheria). Late in the disease, after the subsidence of the primary fever, true diphtheria may also coexist.

Should this membranous condition, from whatsoever cause, become severe, the local dangers are from extension along the mucous membrane of the nasopharynx and Eustachian tube to the middle ear. Swallowing is made difficult and painful; the breath is fetid, irritating discharges exude from the nose and throat, respiration is impeded, and the larynx so narrowed by obstructing membranes as to imperil life directly. Along with this the glands of the neck are invaded, a dense cellulitis is set up, often extending from ear to ear. Constitutional symptoms are severe, too, owing to streptococcus toxemia or to suppuration in the glands, pneumonia, or nephritis. In the very worst cases gangrene may set in, causing extensive loss of tissue, or along with a profound increase of the aforesaid symptoms, membranes darker and dirtier looking, sloughing takes place, often extensive, involving the blood-vessels, and fatal hemorrhage may result.

The accompanying constitutional features are shown by increments of intensity of all bad symptoms, profound asthenia, and cachexia, with little or no tendency to repair.

The cervical lymph-nodes are swollen in almost all cases, especially

when accompanied by severe throat trouble, which may remain as merely an acute inflammation or proceed to suppuration; a cellulitis of the neck may accompany, especially toward the end of the first week. This should be relieved early by free incision, or it may extend to the deep tissues and involve the blood-vessels, hence producing hemorrhages.

The ears, so commonly involved in scarlatina, are affected by extension along the Eustachian tube from inflammation in the throat. It occurs in younger children, and varies with the character of the epidemic, yet in some severe ones the feature is often rare. Otitis arises at the height of the disease or during convalescence. There may then be pain, extra fever, and recognizable deafness, or otitis may be accompanied by no special subjective symptom, and only give evidence by pyemic states or meningitis. The exceptional rise in fever which usually accompanies this falls promptly when the drum ruptures.

The treatment is heat, preferably dry, as from a hot-water bag, hot salt, bran, brick, or soapstone, the child's head to be laid on this, a thin pillow intervening. Prolonged poulticing encourages suppuration, hence should not be practised. A small object, like a glove finger, filled with salt and gently placed in the ear, gives comfort. One should never drop oil or laudanum in the ear of a child. Blood-letting by leeches is valuable in those not too young or too weak. After these means are used, opium may be tried cautiously for the relief of pain. Should the pain continue or increase and the temperature remain high, or if cerebral symptoms are added, operation is called for. It is not a difficult thing to make a puncture into the ear-drum, and should be done when indicated. This will relieve tension and pain and let out a little blood; thus the formation of pus is possibly prevented and much suffering avoided. Later, operation may be demanded to let out pus and to prevent extension of inflammation to the bony parts, but this is better done by a skilled aurist. When the drum is incised or ruptured, the discharge should be carefully and persistently cleansed away. This is best done by a soft-rubber ear-syringe and a warm lotion (85° or 90°) of saturated solution boric acid, normal salt solution, or bichlorid, 1 : 5000, and, if abundant, repeated every two or three hours, or at least several times a day. Use no cotton covering nor plugging. To dislodge accumulations of pus peroxid of hydrogen is useful, alone or diluted. The nose should be cleansed, too, regularly, by atomizer in an older

child or dropping-tube in infants, using Dobell's or Seiler's or other alkaline antiseptic solution, warmed.

The nervous system is rarely affected in scarlatina otherwise than shown by the convulsions and vomiting of onset. Meningitis may follow severe otitis by extension. The digestive organs are disturbed as in other febrile processes. The vomiting of onset is rather an evidence of systemic poisoning than a local disorder, or it may be a cerebral symptom. Its occurrence, late in the disease, may evidence uremia. The tongue exhibits a peculiar coating which clears off in a characteristic manner, giving rise to the so-called strawberry appearance. In typical cases there is usually a rapid rise in temperature, 103° to 105° , even in the mildest above 100° , and along with this the increase in force and frequency of the pulse (from 120° to 150°) in excess of what the state of the child would apparently warrant.

Treatment.—The preventive treatment of scarlet fever is by far the most important and is more practicable than in any other exanthem, because the infectious principle, although most tenacious of life, is not so active as that of some others. Strict quarantine is particularly efficacious, and thorough cleansing and exposure to sunlight and air day and night will usually destroy the focus of disease. Isolation, with proper precaution, is entirely effective in this disorder. A room should be chosen which can be isolated; if this be impossible, keep the child in the same one in which the infection first showed itself, and do the best one can. The care of the room is of the first importance; every movable object should be taken out except those absolutely needed. Temporary curtains of sheets wrung out of antiseptic solutions (Labarraque or bichlorid) may be hung in front of doors. The dresses of the attendants should be washable, and their hair protected from contamination by a close-fitting cap. The physician should never enter the sick-room without extreme precautions, and be specially attired. The room should be exposed to the sun and kept cool and airy, provided with, if possible, an open fire-place, the temperature at first 68° at the head of the bed; later, cooler if fever is high, or warmer if complications arise. The body of the patient is the better for constant anointing with boric ointment, which should be wiped off afterward and will thus assist in cleansing as well as disinfecting, and prevent the spread of the epithelial scales during the process of desquamation, which are so highly infectious. This should be supple-

mented by daily spongings of the surface in tepid water, to which it is well to add green soap. Recent observers report excellent results from rubbing the body three or four times a day with oil of eucalyptus, or five per cent. ichthyol. (For further remarks on disinfection of the room and clothing, see Diphtheria).

In the prophylaxis of the individual it is especially important that the throat receive attention, not only of the patient but of all others exposed to the infection. In the patient it seems probable that an ill-conditioned nasopharynx is the instrumental cause of additional infection, hence complications. This should receive almost the first and constant attention, by means of antiseptic washes and applications, astringent and other (described more fully under Pertussis).

Scarlatina is a sublimated disease, and no remedy controls or arrests. The bowels require the first medication, and it is particularly wise, as Jacobi urges, to use, in the very beginning of the disease, moderately laxative doses of calomel, and to repeat the use of calomel on the first appearance of nephritis. The diet should be carefully limited to milk and milk-preparations, light soups, and broths, although there may be permitted, as soon as the fever subsides below 102° , moderate amounts of starch foods. The general treatment of scarlet fever is an intelligent expectancy, watching the symptoms with a critical eye. The system is laboring under an intense poison which can not be artificially eliminated. If the rash does not come out adequately on the skin, warm or hot baths should be employed to the entire surface or only the feet, or, possibly, the wet pack or mustard bath, with the internal use of hot drinks or febrifuges, such as the liquor ammonii acetatis, alone or with citrate of potassium. For high arterial tension aconite is the safest remedy, repeated in drop-doses every quarter or half hour, and then at lengthening intervals along with the saline diuretics mentioned above. If cerebral symptoms appear, it is well to give several doses of calomel and a mixture of bromid of sodium with chloral hydrate, or even calomel and Dover's powder or other opiate, especially codein. If this be during hyperpyrexia, acetanilid and brandy work happily, provided cold applications are insufficient. Disturbances of the digestion are not particularly common; vomiting is occasionally troublesome at first, for which bismuth preparations along with small doses of calomel are useful, given dry on the tongue, or for younger children in solution, along with the aromatic waters,

as the equal parts of chloroform, cinnamon, and lime-water. Diarrhea may be controlled by very much the same measures, to which may be added a little paregoric or Dover's powder, or carbolic acid in minute doses. The cervical adenitis, so distressing in appearance, is to be better controlled by local cleansing of the nose and nasopharynx, and by applications of cold, than by the time-honored officious medication, by iodine, mustard, etc., externally applied.

Rheumatism, or that which very closely resembles it, is a frequent and early complication, appearing often within the first week, and is controllable by the salicylates combined, if very painful, with small doses of acetanilid or phenacetin or the other coal-tar analgesics. The affected joints should be wrapped in cotton wool with moist applications of some alkali. This may be complicated by endo- or pericarditis, which demands extra precaution and appropriate treatment (see Endocarditis). A. H. Hodge says, scarlet fever predisposes to rheumatism. The lungs are not so frequently affected as in measles, nevertheless they occasionally suffer. The heart, as in all infectious processes, demands the most solicitous watching. The most serious complication of scarlet fever is nephritis. This varies according to different epidemics and also with the amount of care the patient gets from the first. Probably the worst cases arise from mild attacks of the fever which frequently escape detection, and hence insufficient precautions are used. Rest in bed is absolutely essential to safety, as only thus can a uniform temperature be maintained over the entire skin surface. The urine should be examined almost daily from the first, and also long after the child has been allowed to get up and be about. Should albumin appear, or the urine become scanty, or the limbs dropsical, every effort should be directed to encouraging the action of the skin and intestines, which must then assume part of the functions of the damaged kidney. Water is the great diuretic, especially a bland water free from salines (Poland water), and the child must be induced by various devices to consume as much of this as possible. All sorts of innocent things may be added to water for this purpose, making it as attractive as possible. The skin must be excited by baths, warm and gradually heated from 90° up to 100° or 105°; or by the wet pack, and again changing these, if depression sets in, to hot-air baths and foot-baths. Ichthyol, five per cent. in lanolin, is extolled as an antiseptic application.

Of medicines, pilocarpin stands at the head, from $\frac{1}{30}$ to $\frac{1}{25}$ of a grain, also the acetate and citrate of potassium, made agreeable by lemon juice or other aromatics. Cathartics are often required, such as calomel or the compound jalap powder, but are dangerous as depleting the blood and weakening the heart. Locally, poultices do service. Dry cupping has its merits, too; also, stimulating liniments and local wet packs. Later, if anemia be apparent, a well-matured tincture of the chlorid of iron is an efficient remedy, alone or added to dilute phosphoric acid, or in the form of Basham's mixture. If blood appears in the urine, astringents are required; ergot and gallic acid and nitroglycerin, $\frac{1}{300}$ to $\frac{1}{200}$ of a grain in alcoholic solution.

Cerebral complications, restlessness, continued convulsions, insomnia, and delirium are in a great measure the result of the intensity of the febrile movement, and in a sense are the criteria of the severity of the disease. These are best controlled by the water applications, baths, packs, etc., and if continued by cold to the head,—a good way is to hold the child's head over the side of the bed and pour cold water on it. Convulsions may be evidences of uremia.

Malignant cases demand powerful stimulation with ammonia, whisky, caffeine, musk along with strychnin. Alcohol may act as a useful tranquillizing agent.

The throat is constantly a source of solicitude. In almost all cases on the pillars of the pharynx, posterior walls, and uvula are seen the characteristic macular eruption. Here antiseptic and astringent solutions are of value to relieve symptoms.

Certain variations are noted in the symptoms. Secondary rashes deserve further study. The rash is sometimes nodular or papular, causing an appearance like "goose flesh," or vesicular. It may come and go intermittently; urticaria may coexist; occasionally minute hemorrhages appear on the surface, causing an appearance of "blackness" or rather a deep purple; this is common in malignant cases, but not constant. Congestive states or inflammatory disturbances of internal organs have a tendency to modify the character of the rash, lessening it as a rule.

M. Roger, Huber, and Blumenthal have recently reported good results from the injection of serum from convalescents. Gordon reports good results from antistreptococcic serum; Rappapart regards it as useless.

SMALL-POX.

Synonym.—VARIOLA.

Small-pox may be disposed of in a very few words, not because it is of minor importance where and when it occurs, but for the reason that it is only rarely seen in civilized lands and soon will, in all probability, disappear altogether. There is nothing peculiar to small-pox as appearing in childhood, and the subject is treated of at length in large text-books on medicine. So long as isolated cases do occur, however, it is imperative to insist on the one ample and easy means of prophylaxis which we possess in vaccination, without which precaution no one is as yet safe.

VARICELLA.

Synonym.—CHICKEN-POX.

Varicella, or chicken-pox, is a mild infectious disease of childhood ; the chief characteristic of which is a papular rash rapidly changing into vesicles and always appearing in successive crops. Though quite a distinct entity, it bears close resemblance in many of its symptoms to a modified form of small-pox. Varicella is distinctly a disease of childhood ; few adults and those only who have been nursing or thrown into intimate and prolonged contact with the patient being attacked by it. Its right to a distinct place in the list of infectious diseases, in contradistinction to its being merely a modification of variola (as is sometimes stated), lies in the fact that varicella and variola do not mutually afford immunity, that variola affects all ages, and that direct inoculation with the virus of variola always produces that disease and likewise varicella inoculation invariably (when the operation is successful at all) produces varicella. The disease occurs in epidemics and is especially common in the poorer districts.

Causes.—Chicken-pox is due, in all probability, to its own specific germ. It is contagious, and the infective principle retains its vitality for a considerable period in clothing, bedding, etc. It may be communicated from child to child by direct contact, and a third person can also be the medium of communication. Investigators variously estimate the period of incubation, a fortnight being the average time.

Symptoms.—Before the outbreak of the eruption there is gener-

ally experienced a feeling of slight illness; some headache, but no definite premonitory symptoms. Usually, the first notice of the disease is the appearance of the eruption itself. At or before the period of the eruption there are loss of appetite, weariness, and, as the macules appear, fever, the temperature rising to 101° or 102° F. There may be also chilliness, and in very severe cases even convulsions, although they are very rare. The eruption appears simultaneously in different parts of the body, beginning, as a rule, in the borders of the face and behind the ears and in the edges of the hair, and consists in successive crops of rosy papules (not unlike typhoid fever) and small bullæ or blebs, which are of the simple unilocular variety, not umbilicated as in variola, or very rarely. The base of the vesicle is inflamed and there is a slight aureole of flushed skin around the papule. The vesicles contain a limpid fluid, which remains fairly clear unless irritated, as by scratching, when it is liable to become purulent or ulcerative. Usually the vesicles dry up in a few hours and a scab forms, which ultimately falls off, leaving a clear unscarred skin underneath. This is the normal termination of the varicella eruption, though it not infrequently happens that a scar similar to the scar of small-pox is left behind. The successive crops of vesicular papules last about a week, although the disease itself is over in half that time. If pricked, the vesicles collapse. The number of these vesicles over the body varies greatly, sometimes being few in number and at others quickly dispersed over the entire body; the face, however, having a much smaller number in proportion to other parts.

Diagnosis.—As already stated, modified small-pox may be mistaken for varicella. The principal points of differential diagnosis are as follows:

VARICELLA.

1. Incubation about fourteen days.
2. Premonitory symptoms slight.
3. Premonitory fever lasts but a few hours.
4. Temperature rise slight.

MODIFIED SMALL-POX, OR VARIOLOID.

1. Incubation twelve days.
2. Severe, with high temperature, intense backache, vomiting; all symptoms of a severe disease.
3. Lasts two or three days.
4. Temperature rises suddenly and reaches its height when papule is fully developed, after which temperature falls. No secondary fever.

5. Rosy spots, macules becoming vesicular in a few hours and drying in three or four days, leaving crusts. Eruption comes out in crops and spots, are not confluent. No pustules.

5. Red shot-like papules appearing on face, anus, and mucous membranes. In one or two days the papules change to vesicles, and on eighth day develop into pustules.

VARICELLA.

1. Appears chiefly in children.
2. Duration of disease short, and symptoms very mild.
3. Eruption papular or vesicular; never pustular.
4. The eruption is superficial, rarely umbilicated, not partitioned, multilocular and discreet.
5. Eruption appears chiefly on hands and feet, very little on face.
6. Not influenced by vaccination or previous attack of small-pox.

VARIOLA.

1. Attacks persons of any age.
2. Period of invasion three days; general symptoms severe.
3. The papular stage is longer, and the eruption ends with formation of pustules.
4. Eruption is deep seated and hard, usually umbilicated; the vesicles being partitioned and frequently confluent.
5. Eruption chiefly on face, hands, and feet.
6. Prevented by vaccination or previous attack of small-pox.

Delicate children should be isolated. Those attacked should be carefully guarded.

The **prognosis** is invariably favorable. In unhealthy children, especially those affected with scrofula or tuberculosis, the vesicles often degenerate into ulcers, and these may spread and take on a serious aspect.

Treatment.—Chicken-pox calls for very little treatment, but it is of more importance to insist upon rest and freedom from exposure than is ordinarily taught or practised. While it is perfectly true that children suffering from this minor exanthem are usually permitted to run about and disport themselves much as they like, upon the assumption of the parent or physician that the dangers of complication are small, yet it is certainly true that complications do arise sometimes seriously affecting organic integrity. A child suffering from chicken-pox should be isolated at least for a week, and kept under uniform and controllable conditions of air and temperature, thoroughly protected from chill or exposure, or undue fatigue, supplied with a simple dietary and a diuretic and diaphoretic, and go early to bed. During convalescence, definite control should still be exercised over fatiguing conditions, exposure to extremes of heat or cold, and some attention given

to the digestive organs and dietetics. Some poverty of the blood is liable to result from even so slight a febrile process as this, and a tonic with change of air should be supplied when convenient or obviously needed.

TYPHOID FEVER.

Synonym.—ENTERIC FEVER.

Typhoid or enteric fever is an acute infectious disease due to a specific bacillus (Eberth). It is, in children, in most essential respects similar to the same disease in adults, although in some clinical features there are differences which must be considered. Moreover, typhoid fever, in recent years, differs in many particulars from those forms observed and described in the past. For a long time it was thought that infants and young children were immune to this disease; but although rarely, yet we do find it occurring in children only a few months old, but in these instances it is almost inevitably acquired from a nursing mother who is herself infected. We have, ourselves, recorded cases of this disease in babies of five and eight months of age.

Typhoid fever may be described as an infectious disease, due probably to more than one cause, the chief of which is the bacillus of Eberth, characterized by a continued fever lasting from one to three weeks, a peculiar eruption of small rose-colored spots which disappear on pressure and appear in successive crops. Along with this are certain characteristic lesions in the ileum accompanied by gastro-intestinal catarrh. The prevalence of this disease among children is presumably much more extensive than we can ascertain, as many cases of mild and ill-defined character probably are never recognized as such. Especially is this true among the poor.

Causes.—The causes may be said to be predisposing, specific, and contributory. Undoubtedly there are certain individuals who are more liable to this disorder than others, and these vary in their susceptibility. Many collateral causes influence susceptibility, of which the season of the year is one of the most pronounced; so much so that it has received the name of "autumnal fever." Age also is an important factor, by far the largest number of cases occurring in later childhood, and most in early adult life, and is less both above and below the ages of fourteen and twenty-five. There is little influence exerted

by sex, climate, or mode of life. Atmospheric conditions affect the prevalence of the disease, dry heat seeming to favor, and cold and damp rather to check, its prevalence. A degree of immunity seems to be acquired by repeated exposures to infection.

The bacillus of Eberth is constantly found in those dying of typhoid fever, but it is not proven that this alone is the exciting cause of the disease. A number of causes may be described as contributory or supplemental, which were for a long time regarded as efficient. These are sewer gases, evil smells emanating from various sources, defective ventilation, and the like. It is pretty well determined that these in themselves are incompetent to produce infection. They may possibly convey small amounts of poison to the air-passages, whence they become entangled in the mucus and are swallowed, but this is unlikely. By acting as profound depressants they may create or aggravate a condition of susceptibility, and they certainly do so depress the vitality as to diminish the powers of resistance. Enteric fever is, strictly speaking, contagious, but it is very rare to learn of instances of direct contagion. Undoubtedly, in the homes of the poor where one member of the family is infected, others acquire the disease. Here two causes are at work, a similarity of infective source and direct or immediate contagion. Nurses in hospitals have acquired the disease, presumably from handling the dejecta and the soiled clothing. Thus bacilli may be passed by accident into the mouth and thence proceed to work their mischief in the ordinary way. Immediate contagion is by far the most common. In most instances the poison is conveyed by drinking water. Various articles of food, particularly milk, are equally responsible, but this again may be directly or indirectly through water conveyance. The bacilli retain their vitality for weeks in water, but probably do not increase therein to any extent. They may live in ice for months. In the soil they remain vigorous, and also increase, and so in milk; they are readily cultivated without changing their appearance. "Once in the intestinal canal the typhoid germs probably do not, like the cholera bacilli, increase in the secretions, but penetrate the epithelial lining and reach the lymphoid tissue, upon which they exert their specific action, causing a cell-proliferation greatly in excess of the physiologic process" (Osler). When introduced into the human body the bacillus is capable, under favorable circumstances, of indefinitely reproducing itself and retaining its

activity. It tends to collect in certain organs, especially the liver and spleen. "The bacilli penetrate into the solitary follicles and Peyer's patches, and there multiply and form colonies. From these colonies they migrate by way of the lymphatic vessels to the mesenteric ganglia, and by way of the radicles of the superior mesenteric veins to the liver, to be finally distributed by the blood current to the spleen and other organs" (Wilson). Incubation varies enormously and is variously stated to be from two days to three weeks.

Morbid Anatomy.—The postmortem findings in typhoid fever are thoroughly characteristic and quite independent of symptoms. The febrile movement and various items making up the clinical picture of enteric fever are quite independent of these lesions and are due to the action of specific poisons or toxins. The anatomic lesions, as pointed out by Wilson, fall naturally into two groups, the first including those which arise from the local action of the bacilli and their concentrated ptomains, and affect changes chiefly in the lymphatic system and the intestinal canal. The second group includes lesions due to long-continued constitutional infection, consisting of degenerative changes in various tissues and organs, particularly the liver, kidneys, voluntary muscles, heart, salivary glands, and pancreas; less conspicuously in the nervous system. These last are least extensive and conspicuous in children, nor have they been so carefully studied. The most conspicuous lesions are seen in the digestive tract, though here the destructive changes are far less than in adults; oftentimes there is only moderate redness and swelling of Peyer's patches, solitary follicles, and mesenteric lymph-nodes; lesions frequent in cases of simple diarrhea (Holt). Sometimes the pharynx exhibits diphtheric exudation; the esophagus is at times ulcerated and the mucous membrane of the stomach inflamed. The constant and characteristic lesion is of the solitary and agminated glands in the lower part of the ileum, evidenced at first by swelling and hyperemia, attaining its maximum about the end of the first week, and then undergoing resolution without ulceration. If the lymphatic infiltration continues, in another week necrosis results and an ulcer is formed, which in children has a tendency to heal. If the ulceration becomes deeper, it may involve the whole of a Peyer's patch, and attacking the walls of an artery produce hemorrhage, or the wall of the intestine may be perforated unless protected by a plastic lymph. Hyperplasia of the lymph-folli-

cles, in children especially, occurs in other diseases involving the intestines, as in measles, diphtheria, and scarlet fever. In children the swelling of Peyer's patches is seen earlier than in adults, and most often near the ileocecal valve, but is also found higher up in the small intestines. Under six or seven years of age the process is much less severe. Hemorrhage is also comparatively rare, and seldom earlier than the third week. The spleen is usually found swollen and in all cases more or less involved, but distinctly less so than in adults. Various other changes incident upon intense toxic infection and protracted fever are seen in other organs, such as a hyperemic state of the liver, diminished amount of bile, degenerative changes in the kidneys, with or without albuminuria. The heart is liable to involvement, and while endocarditis and pericarditis are rare, the myocardium is liable to atrophy, and usually becomes relaxed and flabby or may undergo fatty degeneration. The voluntary muscles suffer sometimes profoundly. The lungs exhibit characteristic changes resulting from enfeebled circulation and obtunded nerves. Hypostasis is common, also pulmonary edema. Lobar pneumonia not only occurs, but sometimes appears at the beginning.

Symptoms.—The course of typhoid fever in children while less severe, is very similar in its more conspicuous features to that of adults. This is true of by far the larger number of cases as seen by the average observer. We are more liable to meet with and recognize instances of the disease which pursues the ordinary course as seen in older folk. There are those who do not agree with this view, but regard the disease as manifesting itself differently in children. The successive periods of development are not so clearly defined. Very many less well-marked cases escape attention, unless it be very sharply aroused, and this frequently happens, the cases presenting themselves only during a relapse or in the stages of subsidence. The febrile process is generally less severe, although the temperature range may be equally high. The symptoms rarely reach the same severity as among adults; the complications are fewer and the sequelæ less marked. We recall no less than twenty cases of typhoid fever in children ranging from five to twelve, occurring in the last five years, which pursued a perfectly typical course with recovery. We can also recall probably twice that number of children applying at the out-patient department of the Children's and the Polyclinic Hospital service, that we had regarded

as probably suffering from typhoid, but who disappeared from view after but one interview; the most of them got well as we have reason to know. Had there been increased severity or complications, the greater part of these would have again applied for advice. They were subsequently seen for slight ailments in no way connected with this disease. Certain other cases gravely suspected of being aberrant typhoid presented themselves regularly until quite well. Prodromes, except in severe instances, are usually of the vaguest, and these are generally connected with the digestive tract. Nose-bleed is rare in children, and so is diarrhea, and headache is rarely ascertainable. The temperature, when typical, rises slowly from two to seven days, remitting a degree or two or even three in the second week, declining steadily in the third week, at the end of which the normal is reached. It may shoot up abruptly to 102° or 105° F. at once, but later run the regular course of gradual rise and fall.

In young children the febrile progress is often from only eight to fourteen (8 to 14) days (Morse). average course under ten years, 19.3 days; ten to fifteen years, 22.6 days; after the age of ten this course is much like that of adults. The maximum fever in mild cases is 103° to 104° F.; in severe cases it may reach 105° to 106° F.,—higher than in adult cases of similar severity.

Typhoid fever is about the only disease where the temperature runs higher in older than in younger children (Holt). Subnormality obtains at the end of the course and rises are due to intestinal or other disturbances. The tongue is not so characteristic as in adults, and may be quite clean. There is a peculiar thick, heavy coating with the tip and margins free, with sometimes a V-shaped oval red place in the center, which is claimed to be pathognomonic; but the absence of striking lingual features is in no way reassuring. There is usually loss of appetite from the beginning, but food will be accepted, nausea being rare and vomiting more so. The mouth, tonsils, and nasopharynx are usually inflamed looking, and may exhibit a pretty severe catarrh, especially in those of impaired nutrition. The bowels are rarely loose, at least it seems so nowadays, constipation being much more frequent than formerly taught. It is present in about half the cases (Holt; Morse says one-third). Constipation at the beginning may be succeeded by diarrhea later in the attack. The gurgling and pain in the right iliac region means comparatively little in children, because it can be so

constantly elicited even in the well. The spleen can nearly always be felt enlarged, and is quite a characteristic and early sign of typhoid fever in children; it is also often tender. The size is an index of prognosis as well as diagnosis; while it persists, the disease is not ended. The eruption, which is a very common symptom,—sixty per cent. of cases (Morse),—is noticed early in the course of the disease, and consists of pale, red, "rose-colored," flat, slightly elevated spots, which on being pressed with the finger disappear for a moment and reappear somewhat slowly. They are usually few and scattered, but occasionally very abundant; generally seen on the abdomen, but if in large numbers they may also be found on other parts of the body. The abdomen is usually more or less distended and increasingly toward the middle or later end of the course. There is almost always, very early, slight sensitiveness on pressure, but tenderness in children is seldom extreme and more apt to be present along with constipation. Marked tympany is rare and severe. Abdominal pain is absent. Colic may accompany or precede an action of the bowels. The kidneys are seldom disturbed seriously. There is no constant relation between the condition of the bowels and the intestinal lesions (Holt).

The heart, while enduring more readily the depressing effects of the fever in children than in adults, nevertheless requires very careful watching, as asthenia is by no means rare, and collapse has been known to come without warning. Savestre asserts that syncope and death may occur with the utmost suddenness, and that it is more important to watch the pulse than the temperature range. The disappearance of the first sound of the heart, while not a grave symptom, is an indication for increased caution and stimulation.

Relapses are practically reinfections, and are more liable to occur after a mild than graver attacks. One attack induces a fair although by no means certain immunity to subsequent infection. Disturbance of the respiratory system, especially at the beginning, is so common that it may be regarded as a phenomenon of the disease. Cough is common without corresponding physical signs. Bronchitis, when present, is usually of moderate intensity. If bronchopneumonia occur, the respiratory murmur becomes much weakened, and percussion resonance is impaired on the surface of both lungs. A mere hyperstatic congestion is also not uncommon, especially where the circulation is enfeebled.

Complications and Sequelæ.—These in children are mild and not frequent. Bronchitis is a usual accompaniment. Intestinal hemorrhage, perforation, and peritonitis are the commoner and more serious complications. Nervous symptoms are often present but rarely severe. Certain of the tissues are liable to suffer apparent parenchymatous inflammation, as the kidney, parotid gland, and the muscles. Certain complicating conditions involve the lungs, as thrombosis, embolism, hypostasis, edema, and pneumonia occasionally. The exanthemata may precede, coexist with, or follow typhoid fever. So also of diphtheria and whooping-cough. Tuberculosis does occasionally follow.

Diagnosis.—In children, as has been said, the progress of typhoid fever is attended with so much irregularity that the diagnosis is oftentimes exceedingly difficult, and frequently it is not recognized at all. Epistaxis is rare, catarrh of the respiratory tract is frequent, and the temperature range is more irregular than in adults. Nervous symptoms are frequently prominent but rarely severe; there is often restlessness and delirium, and many times headache but seldom convulsions. Constipation rather than diarrhea prevails. The rash is usually slight and may be absent; fatal hemorrhage and perforation are seldom seen. The characteristic phenomena are the enlargement of the spleen, eruption, peculiar temperature range, and abdominal distention. The method of testing the blood after the manner of Widal will make the diagnosis much more exact in future.*

* *The Serum Test for Typhoid Infection.*—In March, 1896, Pfeiffer and Kolle published an article in which they claimed that the serum of convalescents from typhoid, when mixed with cultures of the typhoid bacillus and injected into the peritoneal cavity of a guinea-pig, produced a specific reaction. The bacilli become agglutinated and finally deformed and dissolved, and this change takes place only with typhoid bacilli when typhoid serum is used, and is due to the bactericidal action of the typhoid serum. This reaction was also demonstrated in a test-tube, the bacilli falling in fine, whitish flakes and settling at the bottom after a bouillon culture was mixed with the serum from an immunized goat and placed in the incubator for an hour. The first practical application of this method of diagnosis on a large scale was made by Widal and reported June, 1896, in "La Semaine Médicale." He found finally that by drawing blood from the finger of a typhoid-fever patient and allowing it to clot so that the serum separated, and if such serum be then added drop by drop to a broth culture in proportion of one to ten, at the end of twenty-four hours the bacilli were agglutinated and immobilized. Later he noted that the dried serum and the dried blood showed this specific action, occurring as early as the seventh day of the

Gastro-intestinal disturbance is generally present from the beginning, but seldom in the form of severe diarrhea, and causes this disease to be readily confounded with pronounced and subacute disturbances of the digestive tract. The spleen can nearly always be felt and is increased in size. It has been suggested to puncture this in suspected cases and to examine the blood for the bacillus of Eberth. The rose spots will generally be evident at the end of the second week, and by this time the clinical picture is generally clearly marked, the most important feature of which, as in adults, is the temperature range, with its morning remissions and evening exacerbations in steady progression to the characteristic gradual descent; and during this period the diseases with which typhoid fever may be confused are meningitis, influenza, tuberculosis, enterocolitis, remittent fever, and even small-pox and trichinosis. In meningitis there is usually vomiting at the onset, marked

fever and remaining for a considerable period after recovery. Widal and Achard made further tests to ascertain the properties of the agglutinating substance. It was found in the serous fluid of blisters, serum from pus, tears, urine, and milk of persons sick with typhoid fever. This property resides in the globulin and fibrin, but not in the plasma of the blood. The reaction is most pronounced at the height of the infection. It has disappeared one day and reappeared the next, but, as a rule, diminishes in intensity soon or late after convalescence—months or years. In some cases it appears not before the third week and rarely not at all. Wyatt Johnston, of Canada, introduced the method into municipal laboratories and suggested that the blood be dried on a glass slide and sent by the physician to the laboratory. The technic at present employed is to obtain a few drops of blood from the cleansed finger or ear-lobe of the patient and allow it to dry on a piece of clean paper or glass slide. This specimen is then sent to the laboratory, where the dried blood is mixed with five times the quantity of water. A drop of this mixture is placed on a cover-glass, and to it is added a drop of a fifteen- to twenty-hour bouillon culture of the typhoid bacillus. It is then examined under the microscope in a hanging drop. In a few minutes (five to ten) the reaction occurs, a few bacilli moving slowly while the mass of the bacilli are nearly motionless and clumped together, or all the bacilli may have ceased moving and be collected into clumps. The test is quantitative, not qualitative; agglutinating substances are present in normal blood, but in far less quantity. In the blood of a sufferer from typhoid fever the reaction takes place much more quickly and effectively and in greater dilution; the test, to be proper, must occur in a 1:10 dilution of dried blood, and within ten minutes. In two-thirds of the cases of typhoid fever it is possible to make a positive diagnosis by this means. The absence of the reaction in any single examination does not exclude the diagnosis of typhoid fever, but the absence in a series of examinations is of value in excluding the disease.

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headache, and tendency to retraction of the abdominal walls; in tuberculosis the temperature range is irregular, there is rarely tympany, the belly is flat, and the delirium, when present, is apt to be more wild. Influenza strongly resembles typhoid fever, at least for a short time; but the febrile process is more abrupt and the organic disturbances more rapid and pronounced. Remittent fever in malarial countries is a large source of confusion with typhoid, and particularly so where, as sometimes happens, typhoid fever is modified by the malarial poison. The ready examination of the blood for the plasmodium malariae will at once make clear that element.

Prognosis.—As has been said, a statistical knowledge of the prevalence of typhoid fever in children is exceedingly inexact, many cases escaping recognition altogether. The mortality among children is certainly low, probably much less than one per cent. Some authors claim three to four per cent. In those of good vigor, not weakened by previous disease or organic weakness, death is rare, and when it does occur is liable to be due to some complication and not to the disease itself.

Treatment.—The preventive treatment of typhoid fever is particularly important because thoroughly controllable, but has to do rather with the subject of hygiene than practical medicine. The water-supply of cities ought to be entirely free from infection, and when this is accomplished typhoid fever will become rare. Summer resorts are particularly liable to epidemics of typhoid, where considerable crowding of an alien population overtakes local health precautions; hence it is wiser to make large use of boiled water or reliable bottled waters when not absolutely certain of the local supply. The same may be said of milk, in which the typhoid bacillus may readily appear and grow, the source of which may be an infected cow or well. The question as to whether typhoid fever can be aborted or not can only be answered by quoting individual opinions. In a suspected case the early administration of calomel is a rational procedure, and is productive of no harm and possibly of much good. Other intestinal antiseptics, combined with laxatives, may work with advantage. In no other disease is it more important to insist on absolute rest in bed from the first suspicion to the very end of the specific process, and perhaps a little beyond—at least a week or two. If the child be away from the place where it can best be nursed,—at its home,—it is wise to convey it there

with all due precautions, even at some slight risk. A well-appointed hospital is best.

The diet must be regulated with the utmost exactitude as to kind, quality, and hours of administration. Only fluids are safe, and milk in some form is the main reliance. It should be sterilized, pasteurized, or boiled, and thus is afforded some slight variety of taste; in other ways changes may be wrought by dilution, as with effervescent waters—Vichy, Gieshübler, or others. It may be variously flavored or modified by the addition of aromatic or diluent substances. Barley-water or thin oat-meal water are sometimes admissible. Milk is much improved in its digestibility by being violently shaken in a bottle, where it thus acquires a sparkling quality very grateful to a jaded stomach. Unless the digestive tract be in good tone curds are liable to form in large masses and fats to collect in lumps, and thus irritate the intestine and work considerable mischief. It is sometimes necessary to use only skimmed milk; at other times cream and water. Where milk has seemed to disturb the intestines it is well to use only broths for a day or two, or the raw whites of eggs stirred up in water, or meat juices. After the stomach has thus been rested milk may again be used, preferably predigested, alternating with some meat juice or broth, and gradually thus get back to a plain milk diet. Much ingenuity should be exercised with even these fluid substances, and the urgent petitions of the family to use solid food be smilingly put aside by concessions of this innocent sort. The addition of a few drops of brandy or whisky is sometimes most grateful, and even of Maraschino or Jamaica rum. Indeed, it is well to add a few drops of some spirits or of extract of vanilla to the milk occasionally by way of a treat, and especially to the egg-water. The fermented milk known as koumiss is relished by some children, but not by all. Well-made vanilla ice-cream, diluted with Vichy—a favorite drink with many children—is also a safe occasional substitute. The amount of milk necessary varies considerably, a pint a day being sufficient to support life, especially if it be well digested and well diluted; a few days later it may be necessary to increase this, and to promptly decrease if the food distresses. Two quarts of milk a day is the maximum, beyond which it is scarcely safe to go. This may be supplemented, however, by thin broths or replaced by more sustaining meat extracts. Many careful physicians allow for older children soft-boiled eggs occasionally; others use thin gruels, or even milk-toast; this is not

always safe. Calf's-foot or wine jelly has a solid or agreeable taste, and yet leaves no residue to irritate the intestines. Junket or coagulated milk is also of value. There is a growing confidence in the use of a fuller, more varied dietary in uncomplicated cases. We enjoy the conviction that this is most rational, and under this system convalescence is earlier and much strength conserved. It is often important to use some remedies to aid digestion. A few drops of muriatic acid in water relieves the condition shown by dry lips and tongue. Pepsin and muriatic acid at times are needed. If diarrhea be present, pepsin, along with the diluted sulphuric acid, is better; brandy may be added to this with advantage. The physician must bear in mind that relapses are due to two causes: one, not altogether under his control, a reinfection; the other, absolutely in his power, indiscretions in diet; and from this last also frequently arises sudden, unaccountable death. Three or four days after all fever has ceased we may cautiously begin the use of more solid foods; here the animal broths come in again, in which may be placed a few stale bread crumbs or bits of toast. A safe and very acceptable dish is a piece of not too tender broiled beef-steak, mutton chop, or chicken, which is to be masticated and only the juice swallowed; but the mere act of chewing is a great joy to a hungry child. This may be usually allowed from the beginning or middle of the second week. Then come scrambled eggs and scraped meat, rice- and milk-pudding, and finally the various bread preparations, carefully selected.

For the treatment of the fever antipyretic drugs are to be avoided or most cautiously administered, the main reliance being upon cool baths. Cloths wrung out of cool water (80° to 60° F.), laid upon the body and head, will be found to be very grateful. A more effectual method is that the whole child be swathed in these, beginning with warm water at 95° and replacing by cooler and cooler water, 80° to 60° ; or a piece of rubber cloth may be slipped under the child, the four sides propped up, and tepid, 85° , or cool water, 75° to 70° , poured in, forming a superficial bath. In hyperpyrexia with delirium, the patient may be placed in a full bath with great advantage, or use the cold pack. Full directions for bathing will be described in another place. At all times the temperature should be carefully watched to see that we are not producing a condition of collapse; if so, or if the extremities grow cold, dry heat must be promptly applied,

with stimulants by the mouth or rectum or hypodermatically. The inhalation of oxygen is here often used.

Of the coal-tar antipyretics, antipyrin and phenacetin are preferred by some and acetanilid by others; guaiacol, locally, has many adherents. Quinin, if there be malarial complication, acts happily, but is capable of doing harm. It is best given by the rectum. If antipyretics are used it is well to combine with them some stimulant or cardiac tonic, as strychnin. The use of the occasional antipyretics, acetanilid or phenozone, along with the tepid bath or sponging and a little brandy or wine whey gives most gratifying results. For tympany, enemata of ice-water, alone or in combination with some carminative, as fennel, catnip, or chamomile-water, or with two to four teaspoonfuls of turpentine (emulsified by white of egg), relieves admirably. Turpentine by the mouth is perhaps the most satisfactory of all remedies to relieve abdominal distention or intestinal distress, which so frequently arise during the second week. Where there is diarrhea also, the turpentine may be administered with aromatic sulphuric acid; to this may be added bismuth, naphthalin, salol, or a minim or two of tincture of opium. It is sufficient to give turpentine every four hours for meteorismus, but to check diarrhea these and the other substances just mentioned should be given every hour or two while demanded, and the interval lengthened when this ceases. Asafetida tincture is useful here. One of the most powerful astringents, and yet a safe one, is acetate of lead.

For constipation, which is much more frequent, it is perhaps best to wash out the lower bowel. To the rectal injections may be added turpentine or castor oil, or both. A valuable internal remedy is olive oil in good-sized doses; entirely harmless, laxative, nutritive, and protective to inflamed surfaces. If hemorrhage occurs food must be withheld altogether for a time; when given it should be in small amounts and cold. As a hemostatic turpentine acts happily. Hemorrhage in the typhoid fever of children is liable to soon cease, and too much interference is to be deplored. If symptoms of perforation become evident, a surgeon skilled in abdominal section should be called in consultation, who may oftentimes save life. Hypostatic congestion should be prevented as much as possible by shifting the position slightly, which is easily done by wedging up the mattress or the sheet under the side of the child an inch or two, leaving it so for an hour

or more, withdrawing this and shifting the wedge, which may be a folded towel or roll of cloth, to the other side, and raising it an inch or more; thus the attitude of the child is changed a little and the blood encouraged to gravitate obliquely in these successive directions rather than vertically.

MALARIAL FEVER.

Malarial fever, intermittent fever, fever and ague, chills and fever, and a number of other names are applied to a variety of febrile, specific, and non-contagious diseases caused by the presence in the blood of the hematozoa of Laveran, and characterized by extreme anemia, enlargement of the spleen, and by fever with periodic intermissions or remissions.

Causes.—Malarial fever is very widely distributed and more or less constantly present throughout the known world. In America it is constantly endemic in certain regions, as in the Southern States and here and there in the Central States, especially in low lands near the coast, along the edges of salt or partly salt estuaries, and less so on the great lakes. Its habitat also changes, appearing and disappearing under conditions recognizable or not. Again, the intensity of the attack varies considerably in different years, as does also the type of the disease. Swamp or marsh fever, as the disease is also called, receives this particular name because of its prevalence in low, moist, ill-drained districts, and seems to bear some relationship to man's occupation or interference with the natural conditions of the locality, such as the forming of artificial dams and otherwise interfering with the course of natural water-ways. The contagium seems to be propagated through the air as well as in other ways not clearly demonstrated. Welch states that at the present time two modes of transmission are worthy of consideration,—by aerial transfer and by suctorial insects. Laveran says it is also possibly acquired through drinking-water. Outbreaks of chills and fever occur at special seasons, usually the late summer and autumn, though occasionally in the spring and early summer. Prevailing as it does in tropical climates constantly, the chief increments are in the spring and fall. Laveran originally made known to us the specific micro-organism which is now recognized as the exciting agent of malarial fever, and his researches have abundantly

been confirmed by careful observers in this country and in Italy, also in Germany and India.

In this country and in Italy there are several distinct types of malarial fever: First, mild forms of more or less pronounced characteristics, divisible into tertian and double-tertian fever, quartan fever and its combinations; and severe forms, more or less irregular, occurring chiefly in the later summer and autumn, including remittent malarial fevers, cases of malarial cachexiæ, and certain pernicious forms. In Italy these are exhibited in several forms, but here we see usually the quotidian type, and a special variety of micro-organism has been found to accompany each. The morphologic characteristics of the malarial parasite show it to belong to the class of protozoa containing a nucleus and one or more nuclei.

Pathology.—The parasites found in the blood of those suffering from the malarial fevers belong to the protozoa. The forms in which these bodies have been observed vary; some belong to distinct species, while others are phases of existence in the life of the same organism. The varying clinical manifestations of the disease are due to different species and to phases which the organisms undergo. The parasites are, as a rule, found in the red blood-corpuscles. They are most abundant during the paroxysms. In advanced cases the blood is diminished in the number of red corpuscles with increase of free pigments.

Pathologic Anatomy.—In subjects dead of acute malarial fever there are found some characteristic changes; the brain shows little, perhaps a few punctate, hemorrhages, with slight subpial edema.

In the milder forms of malarial fever there are very slight characteristic changes. In the chronic forms there is a malarial cachexia, of which anemia is the chief feature, with enlargement of the spleen, thickened and adherent capsule, and dark color, showing fibrous thickening throughout. The liver is generally enlarged, and gray or slate-colored rather than brown. In death from pernicious malaria the brain may show some edema under the pia, with evidences of hyperemia and occasionally punctate hemorrhages, possibly due to granular or fatty degeneration of the endothelium of the vessels. The malarial parasites may be found in profusion in the cerebral capillaries. The spleen in these cases is always large, the parenchyma cyanotic, and it may actually suffer rupture. The liver is of slate-

gray color usually. In both these organs the capillaries are filled with leukocytes, and many malarial parasites can be found. The kidneys show relatively few plasmodia.

Symptoms.—The milder forms of intermittent fever—those which are commonly seen in the temperate zone and warmer countries, especially in the spring and early summer—are the tertian and quartan fevers, each with certain variations. Tertian intermittent is the form usually seen in this country. The quartan is very rare and may be differentiated by blood examinations. The outbreak of fever and ague is due to the invasion of the blood by a specific organism, which passes through its cycle of existence in forty-eight hours. The febrile paroxysm occurs when the protozoa reach their height and begin to segment, the process repeating itself with much regularity at intervals of forty-eight hours. In very young children the stage of chill is replaced by mere restlessness, cyanosis, and cold extremities, with yawning, nausea, or possibly diarrhea, and along with this various motor nervous phenomena—twitching or convulsions. In the second or hot stage the fever may rise very high—to 108° F.; the child is restless, thirsty, and the face is flushed, the skin hot, the eyes injected, the pulse full and rapid, severe pain is felt in the head, back, and limbs, and the urine is scanty and of dark color. This febrile condition remains for an hour or two, gradually falling, and a profuse sweat follows. In this stage the fever and pain gradually subside, and the patient falls asleep, from which he awakens feeling well. In older children, beyond six or seven years, the paroxysm is very similar to that in adults; chills, fever, and sweating being well marked. Fever may reach 108° , lasting from a few minutes to an hour. During the stage of the fever there is great thirst, dryness of the skin, fretfulness, and headache, and, possibly, also a repetition of the digestive disturbances. Finally comes the stage of sweating, immediately following which there is evidence of exhaustion, but soon after prompt return to ordinary health. As in most other acute febrile processes, instead of the chill occurring as in adults, the child suffers a convulsion. Sometimes the first symptom (so well remembered by one of us during a long attack of intermittent fever) is scarcely recognized chilliness; if accompanied by blueness of the nails it means the onset of a paroxysm. If, as rarely happens, the case is one of pure tertian fever, the child seems absolutely well on the alternate days. A marked cachexia

may follow all forms of the disease, or accompany cases treated inadequately, or wherever the sufferer has become subject to repeated attacks. Here the fever may be slight or scarcely recognized, but the child exhibits a woeful appearance, with pale, sallow skin, pinched features, eyes sunken, irritable digestion, and recurrent diarrhea. Pernicious malarial fever, rare in temperate climates, exhibits the ordinary phenomena greatly intensified, especially the neuromal features, convulsions, and pupillary changes, passing into coma and collapse or death, with possibly little or no rise in temperature. Bronchitis is a common complication and acute coryza has been known to replace the sweating stage. In children it is usual to note disturbances of the alimentary canal. Diarrheas are probably due to secondary infection in children whose health has been thus lowered. There is little disturbance of circulation, except the vasomotor changes seen during the paroxysm. Slight albuminuria is observed occasionally and hematuria rarely. A number of organic complications are alluded to and doubtless are the results of malarial infection, but not directly due to it; rather evidences of devitalization, blood dyscrasia, and lowered resistance.

Diagnosis.—The periodicity of the attacks, requiring careful observation to determine; evidences of enlarged spleen, which always occurs after a few attacks; and, finally, the presence of the malarial organisms in the blood, will render the diagnosis of malarial fever, even in children, most complete. Osler says that widening experience strengthens the conviction that the value of Laveran's discoveries of the hematozoa, demonstrable in the blood, are only secondary to the finding of the bacillus of tuberculosis by Koch. It is not always easy to make the diagnosis from the clinical picture. The commonest type is the double tertian or quotidian fever. The disorder most likely to be confounded with this is tubercular infection. It must be remembered, however, that the one may be superadded to the other. The greatest difficulties in diagnosis occur in the more irregular and remittent forms and in the malarial cachexia. Here there is the inevitable confusion outgrowing from the disturbed organic activities, of which malarial fever may have been the cause. Certainty can only be reached by blood examination or a practical conviction by the less scientific but easy method of applying the therapeutic test—giving quinin and noting the result.

The **prognosis** of malarial fever is good enough if recognized and adequately treated. Failing in this, mild cases often go to spontaneous recovery. In severer cases the intensity of the outbreaks gradually diminishes and anemia becomes established or a chronic cachexia; or, again, the paroxysms may augment, pass into the pernicious type, and produce collapse and death.

Treatment.—Prophylaxis is the most important measure and will accomplish much, provided the physician is patient and persistent in his efforts and the family be possessed of wisdom, which here, as elsewhere, is rarer than gems. Keeping the child indoors after sundown in a malarial locality, especially when the disease is prevalent, as during spring and fall, is imperative and efficacious. Bedrooms should be upon the second floor at least—as high up as possible. In quinin we possess one of the real specific drugs, and by its use we may confidently expect complete recovery in cases of malarial fever. The exceptions are rare, and have to do rather with individual hypersusceptibility to the drug or impaired organic activity. The best time to give large doses of quinin is immediately after a paroxysm, and it is usually well to do this and follow with regular doses of one or two grains (0.065 to 0.13) three times a day in children under six years of age. For sudden effect or in pernicious cases quinin should be given under the skin; a form recommended for this is the muriate of quinin with urea. In ordinary cases it is better to give the drug distributed rather than in one large dose. The difficulties are in its disagreeable taste and its tendency to produce irritability of the stomach. The best way is to have the quinin in powder and give it in simple elixir, mixing the dose in each instance just before taking. In infants or where the drug is not readily accepted it may be given by the rectum, at least doubling the dose by the mouth. Jacobi says if the attack comes on at regular intervals quinin should be given at a single dose two or three hours before the attack, a dose of five grains sufficing for a child of three years. In attacks occurring at irregular intervals there should be given enough, and a little more than enough—from eight to ten grains in three or four doses during the day. The neutral tannate of quinin is free from much bitterness, but requires two and a half to three times the dose of the sulphate. For rectal administration no acid should be used, and the better form is the bromid, the muriate, the bisulphate, or the carbamid, or in the form of a sup-

pository. Ointments are uncertain or valueless, but in extreme cases of susceptibility may be tried with lanolin. To disguise the taste of quinin, chocolate or a confection of licorice deserves a good reputation. Cachets are of use, but children are readily taught to swallow pills or capsules with gelatin or chocolate coating, especially if these be flattened spheres.

Damonski reports very favorable results from the use of methyl-blue, ten cases out of eleven terminating in recovery by its use. He used the drug for forty-eight hours at a time, and then subjected the parasite at every stage of its development to the action of the drug. In chronic cases Warburg's tincture has been especially recommended.

Brodnax has found acetanilid a very useful agent to abort the chills of malarial fever. This drug acts well with quinin in some cases. While administering quinin, calomel in minute divided doses is a good adjunct to unload the upper bowel and thus open the way to the absorption of the drug.

EPIDEMIC INFLUENZA.

Synonyms.—CATARRHAL FEVER; "LA GRIFFE."

In the last few years epidemic influenza has obtruded itself as a very important disorder in most civilized countries, and is to be found intermittently in nearly all parts of the United States. None of the infectious diseases deserves more prompt and intelligent management, both in prophylaxis and in treatment. Complications and sequelæ demand the most careful and protected attention. The facts that the infection attacks very young children with great readiness, that one attack can not be said to protect against another, and that the prostration is out of all proportion to the obvious organic disturbance, make it a disorder which calls for the utmost persistence and positiveness at the hands of the medical adviser. Epidemic influenza may be described as an infectious disease attended by profound weakness and serious catarrhal disturbance of the respiratory or gastro-intestinal organs and many distressing and dangerous nervous phenomena. There is no distinctive type of infantile influenza, but it complicates some diseases and appears to be antagonistic to others, notably scarlatina and diphtheria. Scarlatina seems to have been subdued by it into a very mild form. With diphtheria it is apparently never

associated, although influenza is frequently accompanied by a form of sore throat, with yellow, pulpy deposit in large masses, closely resembling diphtheria; but in this is not to be found the Klebs-Löffler bacillus, and it disappears promptly upon treatment, even by local measures only. In the character of their toxic influence diphtheria and influenza have many points of similarity; the extreme depression, slowness of recovery, and susceptibility of nervous tissue mark them as much alike; so, also, the influence of these poisons upon the heart, with the slow or irregular pulse, long maintained and sometimes never quite restored.

Causes.—The essential cause of influenza is now admitted to be a bacillus, whose discovery is attributed to Pfeiffer and also to Cannon, and the isolation of which is attended with a good deal of difficulty. It is a small, specific organism, resembling the bacillus of mouse septicemia, but shorter, and appears in the blood and the secretions from the nose and intestines. The earliest site of infection is usually the throat. There are certain contributory causes pointed out, among which meteorologic conditions are mentioned. The spread of the disease is of extreme rapidity and along the lines of travel.

Diagnosis.—If the disease is not known to be prevalent, the earlier cases are liable to be overlooked, unless of great severity. Ordinary acute catarrhs, however, are rarely so severe or accompanied by such pain and prostration, nor does the process extend to contiguous organs. When influenza is epidemic there is less difficulty in recognizing an attack, which is marked by rapid onset, sudden and high rise of temperature, and usually evidence of pain in the head or generally about the body or in some limited locality. Cases of sudden irritability of the stomach and intestines, accompanied by head pains and severe fever may be assumed to be influenza. From pneumonia it may be differentiated by the absence of physical signs in the presence of the general symptoms of chill, cough, etc.; but very soon we may find actual pneumonia as a complication, either when it is thus suspected or following mild attacks of catarrhal fever, when not anticipated; and yet characteristic physical signs will be demonstrated upon search. Often the case presents a complete picture of pneumonia, with, however, an absence of the dullness on percussion, when, in true pneumonia, auscultation would have led us to expect it.

Influenza resembles measles in its onset, both in catarrhal symptoms

and sometimes in the rash. At other times scarlatina is simulated by the throat symptoms, along with a scarlatinal rash, both usually of short duration. When the lung symptoms are protracted and severe, miliary tuberculosis may be feared. Typhoid fever closely resembles catarrhal fever, even in the matter of eruption; but the rose-colored spots in catarrhal fever are more numerous, extend over larger areas, persist longer, and remain as slightly brown discolorations for some time after fading. The fever, moreover, is more irregular than in typhoid, nor do we see the apathetic face so constantly, the countenance being flushed in influenza and pale in typhoid. The mind, moreover, is clear, the temper often irritable. The temperature in influenza frequently shows an evening fall and a morning rise (the reverse of typhoid progression), and often there is a marked rise and fall at periods of a week. Oftentimes meningitis and influenza are scarcely to be differentiated, though in true meningitis the muscles of the neck and back exhibit a characteristic and intense rigidity, of a persistence not seen in catarrhal fever. The diagnosis may be delayed during the progress of ill-defined and mild symptoms, but is made known by the feebleness of the child during convalescence, especially by a weak, irritable heart, and disabilities of various sorts, especially for sustained exertion.*

Prognosis.—Influenza is a very fatal disease, partly from the virulence of the toxin generated in the blood, which may kill outright, and partly from the devitalizing effects wrought upon the great organs, and also from its serious sequelæ and complications. In children these resulting effects are milder and more limited than in adults; neuritis is rare. Persistent nervous cough is perhaps the most frequent. Gastric influenza with profuse nervous vomiting occurs in very young children; there is also an influenzal dysentery, most persistent and depleting. The mortality varies in different epidemics, and in some of them children are more affected, in others adults. Death results in most cases from paralysis of the diaphragm (Allyn). All kinds of children are apparently attacked indiscriminately. So sudden is the

* The difficulties of diagnosis are great, yet to one familiar with the disorder certain things are known. Dr. Ed. W. Watson suggests that it requires a good deal of courage to persist in the diagnosis of influenza till subsequent phenomena appear and confirm; before recovery there is always some doubt. He has assisted us in the preparation of this article.

fatality that sunstroke and malignant malaria or scarlatina may be suspected. The digestive and respiratory organs may escape, the poison overwhelming the nervous system. Weaker children naturally succumb more readily. Robust children, however, are frequently changed into frail, feeble beings for years or for life.

Symptoms.—The usual form of the influenza attack is a severe catarrh of the upper respiratory organs, often beginning with sneezing, sometimes as a laryngitis, less frequently as a tonsillitis, and rapidly extending to the throat and lungs, along with pains in the head or elsewhere, neuralgias or myalgias, disturbances of the heart action, and extremely irregular fever. The next in frequency (perhaps as frequently in children) is acute gastritis or diarrhea, or both, also associated with pains and the other symptoms described. The third form depends upon involvement of the brain or nervous system. It is manifested by irritability and fretfulness (almost pathognomonic), or there may be hebetude, or rather apathy, from which the child is easily roused, and is then fairly bright, not slow and dull of speech as in typhoid fever. There may occasionally be convulsions or coma vigil.

There may be chill and delirium at first, possibly a convulsion and usually extremely rapid, more or less irregular pulse. At once the temperature begins to be flighty and may run high, but not as a rule. This may alternate with or soon be followed by subnormality. All these three groups of symptoms, or so many of them as are not masked by the others, may occur together or in rapid succession. Headache or other pain is evidenced only by the child putting his hand to the suffering locality. The conjunctiva is often irritated and tears are secreted in excess.

The respiratory catarrh is liable to extend alarmingly, involving first one lung, then the other, producing severe bronchitis or bronchopneumonia, which sometimes clears up unexpectedly or swiftly destroys life, largely in proportion to the (not to be predicted) severity of the toxemia or the resistance and vigor of the child.

When the digestive organs bear the brunt of the attack exhaustion is from a double cause. Malnutrition is severe, appetite is often lost after the vomiting or diarrhea is controlled, and a wretched picture is presented of collapse and emaciation.

Complications may involve any and every organ in the body. Tuberculosis is liable to infect the thus depraved constitution. Middle

ear disease often occurs ; also the skin is variously affected by herpes, erythema, and urticaria. Rheumatism, or rather painful arthritis, is a common and distressing feature. The kidneys suffer, but not often. The bones are affected occasionally (a periostitis). Those children having a tendency to rickets are liable to develop it or suffer an aggravation of usual complications. Glandular enlargements are common and persist.

The younger the child the less characteristic are the phenomena. In the very young gastric symptoms prevail. The spleen is sometimes enlarged ; albuminuria occasionally appears.

Treatment.—Prompt and efficient isolation with full means for disinfection is demanded from the start.

To this there should be no demur nor temporizing, though neither the public nor the health authorities fully realize this yet. The treatment must be symptomatic, and among the first comes relief of pain. During the stage of high fever repeated hot foot-baths are most grateful ; and carefully watched aconite tincture, $\frac{1}{2}$ to one minim, may be given every ten or fifteen minutes, or soon to be followed by the coal-tar antipyretics (for temporary use), and next full stimulation by champagne, or spirits in effervescent or plain water, hot or cold, or brandy and ginger ale at short intervals ; also concentrated foods till the stomach can receive more substantial fare. Full feeding is to be given soon and persistently and the stomach reserved for the purpose ; medicines are better given hypodermatically or by the rectum.

For the respiratory catarrhs a combination of atropin, morphin acetate, or codein in small repeated doses gives great comfort. This had best be accompanied by strychnin or digitalin to sustain the heart. Quinin is also indicated, the hydrochlorate best and by the rectum. For vomiting, bismuth subcarbonate may be given in chloroform or peppermint-water or cinnamon-water. For very severe gastritis cocain will often relieve ; $\frac{1}{20}$ or $\frac{1}{30}$ of a grain being given every half hour. A prompt action from calomel, gr. $\frac{1}{10}$ every half hour, is certainly useful here. The hot foot-bath helps this, too, as does mustard to the epigastrium or neck.

Phenazone is a good analgesic and expectorant, and this or phenacetin, along with sodium salicylate, or, better, cinchonidin salicylate every two or three hours, will relieve the myalgia. For intense

muscle pains the hot pack or steam-bath, general or local, is comforting; for painful limbs the flannel bandage.

Convalescents demand the most watchful, persistent care. Here the great standby is strychnin in increasing doses (up to the verge of twitching), and long-continued tonics and nutrients; persistent over-feeding, predigestion,—measured amounts of easily digested foods, meat extracts, tonics of various sorts, digestants; hypophosphites, cod-liver oil, and, above all, change of air, which is demanded in tardy or incomplete convalescence.

EPIDEMIC CEREBROSPINAL MENINGITIS.

Synonym.—SPOTTED FEVER.

Epidemic cerebrospinal meningitis belongs to the list of infectious fevers which occur epidemically and sporadically; it attacks not only human beings but animals, both those in health and, also, and more readily, those who are exhausted by disease and other depressing circumstances. The disease is characterized by inflammation of the cerebrospinal meninges, and clinically is of irregular course. Adults as well as children are affected, but the young are much more susceptible.

Causes.—Epidemic cerebrospinal meningitis arises suddenly without warning in the form of an epidemic, which may attack only a few individuals here and there in a community or create widespread havoc. The specific cause, while assumed to be a microbe, is not yet known or isolated. Those who have made autopsies have found a number of specific organisms, not of a uniform group; however, the micrococcus lanceolatus is more constantly present than any other, but this microbe occurs also in other forms of meningitis. The disease may be caused possibly by a number of different micrococci which become endowed temporarily with some special selective tendency to attack the meninges of the brain and spinal cord. Overexertion, depressing mental or bodily surroundings, poverty, and unhygienic surroundings act as predisposing causes.

Pathology.—If death occurs in the earlier stages of spotted fever the lesions are slight, but if later the appearances of the meninges of the brain and spinal cord exhibit evidences of intense hyperemia. If the case has lasted somewhat longer, pus is to be seen under the arach-

noid. This membrane appears cloudy, especially along the course of vessels from which the exudation doubtless takes place. This purulent exudate covers not only the tissues of the convexity, but may extend to the base in the meshes of the pia and between it and the cortex. A layer of exudate can often be found over the greater part of the spinal cord. The fluid in the ventricles is, as a rule, increased and may contain small floccules of fibrin. The other organs of the body are liable to be affected in such a way as is common to infectious diseases, by hypostases and inflammations generally. The dusky spots or mottling that are occasionally seen, and which give the disease the name of "spotted fever," may be found also in the internal organs.

Symptoms.—The characteristic feature of the spotted fever is its suddenness, as if the poison came out of a clear sky. The progression of the symptoms is very like those of the other forms of meningitis, except that they are developed much more rapidly. A child in perfect health is suddenly smitten with headache or chill, accompanied, it may be, by vomiting or convulsions. If the case be a mild one these features are not so pronounced, but usually the earlier symptoms are quickly followed by stupor, which rapidly develops into profound coma. Often this coma is deep from the beginning and may alternate with delirium; in the lesser cases a distressing restlessness may replace both, accompanied by hyperesthesia. The headache may be replaced by neuralgic pains, especially at first. The vomiting is an early and common symptom and cerebral in character—a sudden gushing out of the contents of the stomach and in such quantity as is almost unaccountable. The pupils are unequal, generally dilated; strabismus is common. The fever begins quite high and runs up to 103° or 105° , but not always; in some cases it is never very great or may be actually subnormal. Sudden rises in temperature usher in serious symptoms. Delirium is rarely absent and varies from wild excitement to somberness, and in a measure indicates the gravity of the disease. Tenderness of the flesh to touch is common, extending down the spine or along the limbs, sometimes localized to one set of nerves and then shifting elsewhere. As in other forms of meningitis, retraction of the head may alternate with clonic spasms and produce complete opisthotonos or merely local stiffnesses. Clonic spasms are frequently met, from a simple twitching to continued subsultus tendinum, and may be the forerunner of convulsions. Paralyzes arise, either of central origin or peripheral, and

are transient or continued. Sensory impairments, as of sight or hearing, occur temporarily, or remain, and on the recovery of the individual the sense organ may be found destroyed. Photophobia is sometimes distressing. Respiration is usually much disturbed and varies greatly; in the beginning hurried, and later very slow; at other times interrupted or jerky, and toward the end in fatal cases of the Cheyne-Stokes type. This last must be regarded, however, as not so hopeless a symptom in children as in adults. Diseases of the lungs and pleura must be constantly watched for. The pulse in cerebrospinal fever is rapid in children, as a rule; in adults, in the later stages, it may be slow. The skin shows characteristic mottlings, usually of a dark purple, and oval in shape, from $\frac{1}{3}$ to $\frac{1}{2}$ of an inch in diameter, and small red and large bluish exudations. Cutaneous hyperesthesia is often noted, and the skin is sore to the slightest touch, either very hot or in other instances quite cool to the hand, and sometimes bathed in perspiration.

Diagnosis.—Cerebrospinal fever may be mistaken for scarlatina in its very early stages because of the eruption, which in scarlatina is so often non-characteristic in its distribution. The throat symptoms and frequent nephritis are to be differentiated in the latter. From other forms of meningitis it is oftentimes most difficult to distinguish, unless the eruption shows itself early in its characteristic small, red, or larger bluish or purplish spots. The epidemic form, also, is usually much more abrupt in onset, and is accompanied by marked hyperesthesia.

Prognosis.—This disease is one of the most fatal of childhood; about one-half recover, and, unfortunately, when recovery does take place, so damaged are many of the organs that the survivor is likely to be lamed for life in many ways, as by deafness, blindness, and local palsies. The complications which may arise are limitless; extensive ecchymosis is an evidence of blood dyscrasia and a fatal sign. Prolonged high fever and convulsions not only threaten life, but are liable to leave serious structural damage upon the brain and cord, with their attendant results, as epilepsy and the like.

Treatment.—The general measures to be employed are those applicable to any case of infectious disease, to which may be added the rational treatment outlined under simple cerebrospinal meningitis. The first thing to be considered in cerebrospinal fever is preventive

treatment, over which we may or may not have control, since the contagiousness of cerebrospinal fever is not proven. During the prevalence of an epidemic, children had best be guarded from contact with suspected cases and from exposure to extremes of heat and cold. Undue bodily and mental fatigue should be avoided, and they be supplied with simple, well-selected food. In the use of counter-irritants in the treatment of this disease care should be used not to allow blistering because the trophic changes are so profound that healing is delayed unduly. There is no specific remedy, and we can only treat symptoms as they arise. The indications are to relieve intense congestions and meet emergencies. Absolute quiet and rest are first to be secured. Dry cups applied to the neck and back, or either side of spine, are of some value to relieve internal congestions of the meningeal vessels; ice to the head and hot baths to the body will aid to relieve the hyperemias and will mitigate the headache. The bowels should be emptied by enemata or calomel. Should the temperature be above $102\frac{1}{2}^{\circ}$ cold sponging is indicated, just as in any other fever; for hyperthermia the cold pack. In view of the constant vomiting, medicines are best administered by enema or hypodermatically. Chloral by enema, three to five grains, and ergot hypodermatically, may be used to influence capillary congestion. Hyoscin hydrobromate seems of distinct value to relieve muscular spasms, restlessness, and insomnia, in doses of $\frac{1}{800}$ to $\frac{1}{200}$ of a grain, and is less likely to produce depression than chloral. Opium is one of the safest and most reliable remedies, preferable in the form of morphia hypodermatically ($\frac{1}{48}$ to $\frac{1}{12}$; second doses, if the first are found to be ineffectual, should be double the first), along with hyoscin hydrobromate or atropia. During the stage of convalescence it is important first to use whatever will aid in absorption and elimination of the seroplastic or seropurulent exudate. Potassium iodid is usually needed, given in effervescent lithia-water or in the liquor ammonii acetatis. For this purpose also, as well as to stimulate intestinal atony, turpentine is of value. Nutrient tonics, especially cod-liver or olive oil by inunction, along with massage very gently begun, are of great use in the repair of tissue waste, especially in the nerves. Hot and cold bathings are useful to the weakened parts, and better than electricity for the paralyses.

Lumbar puncture has been claimed to relieve (Quincke) restless-

ness, pain, and evidences of tension. We have used this in similar cases with satisfaction.

MUMPS.

Synonym.—SPECIFIC PAROTITIS.

Mumps is an acute specific infectious inflammation characterized by pain and swelling of the parotid glands, with occasional (rare) metastasis to the mammæ, ovaries, or testicles. The disease runs a definite course, and one attack usually gives immunity.

Causes.—The cause is evidently a specific poison, but as yet no one has succeeded in isolating it. The germ enters probably by the mouth, reaching the parotid gland by Steno's duct. This disease is observed in all lands at any time of the year, but is most common in this latitude during the fall and winter. Males are more liable than females, and the most susceptible age is between the third and fifth year. The period of incubation is generally two weeks.

Symptoms.—These vary, depending on the nature of the epidemic and of the individual attacked. The stage of invasion lasts from twenty-four to seventy-two hours. The local symptoms usually have a duration of from eight to thirteen days, during which time complications may set in. The stage of invasion is accompanied by a rise of temperature, malaise, some loss of appetite, and occasionally vomiting. The first local symptom is a pain in the space between the mastoid process and the lobe of the ear. Very soon this painful spot increases in size, until the whole region around the ear becomes affected. As a rule the swelling begins in the same place in which the pain is first noticed, and the enlargement becomes general, usually in from three to six hours after its first appearance. Both glands are not attacked simultaneously. In one it begins and has time to partially run its course of inflammation, to be followed in a few days by the enlargement of the second gland. Upon this swelling and its accurate observation depends the correctness of the diagnosis. Much consolation may be derived from the reflection that the acme of the process is attained very quickly and is short lived. The principal complication of this disease is an inflammation of the testicles (orchitis), spermatic cord, and inguinal glands in males, especially liable to occur about the age of puberty, and in females an involve-

ment of the ovaries, labia majora, mammary and inguinal glands. These are in our experience rare. Complications do not, as a rule, appear until the inflammation of the parotid gland has subsided.

Diagnosis.—There is but one gland that lies around the ear, *i. e.*, in front of the ear and following its outline, not only anteriorly, but below and behind, and when this swelling is localized to this general outline we are dealing with only one disease—parotitis.

Prognosis.—When the inflammation is uncomplicated the prognosis is favorable, one of the chief dangers being edema of the glottis, or, as occasionally happens, the parotid gland may break down forming an abscess. When metastases arise as to the mammae, ovaries, or testes, the prognosis is not so favorable. Although these, however, are very rare in our experience, such complications are painful, and while considerably lengthening the duration of the disease, they do not, as a rule, cause serious danger to the individual. Still the possible complication of mumps warrants great care during an attack to guard against chill, fatigue, or digestive disturbances.

Treatment.—This is palliative and expectant. The diet should be liquid for a week. Pilocarpin used in some cases, claimed as a specific, has met with varying success. Warm or hot applications to the swollen glands, as hot olive oil applied on cotton, will almost always prove acceptable to the patient. When the pain is considerable, small doses of an opiate, as Dover's powder, may be given combined with phenacetin or salol. The bowels should be kept open, and where the fever is high it may be reduced by sponging the body with cool water, 70° or 80° F., or by suitable doses of aconite or other febrifuge remedies. As a general rule it is well to keep the child quarantined while the disease is in progress, as its infectiousness can not be questioned; neither should parotitis always be treated carelessly as an insignificant disease, as occasionally cases of fatal gangrene of the parotid and cervical glands have been reported, and Joffroy has mentioned a case in which peripheral neuritis followed with paralysis of the extremities lasting four months.

For glandular complications the inflammation is relieved by various fomentations,—lead-water and laudanum or witch hazel, and the like. Ichthyol twenty-five per cent. in lanolin is soothing and detergent. Painting with menthol is recommended. All measures should be supplemented by support and rest. Packing in dry cotton wool answers very well.

To an inflamed testicle the application of faradism is said to aid in preventing atrophy after the acute condition has lessened or subsided.

WHOOPIING-COUGH.

Synonym.—PERTUSSIS.

Whooping-cough, or pertussis, is an acute infectious and highly contagious disease of early childhood, occurring sporadically and epidemically, characterized by a catarrhal affection of the respiratory tract and a characteristic paroxysmal cough which threatens suffocation. It leaves a peculiar vulnerability of the mucous surfaces of the bronchi and intestines which should never be lost sight of by parent and physician. It spreads with great rapidity through a community, especially in the cold months, attacking the youngest most readily, infecting nearly all those not immunized by a previous attack. Such immunity is almost complete, second attacks occurring only as rare and isolated instances. Children who are much in the open air or living in well-ventilated houses, as in the wards of large hospitals, asylums, and the like, escape more readily than when crowded in close quarters. Infection is almost entirely from direct and immediate contact, but the slightest exposure at short range will suffice. Mediate contagion is most unusual. Whooping-cough is an exceedingly fatal disease, ranking in deadliness to infants next to scarlet fever and diphtheria. It affects babies under six months with the utmost readiness, differing from the exanthemata in this respect; indeed, its ravages are chiefly confined to children under two years, and it is not of frequent occurrence above four years of age and rare after ten.

The essential cause of whooping-cough is probably a micro-organism, but what this is has not been determined. Many contributory causes are recognized of which the age of the patient, as already mentioned, is one of the chief. A depressed state of health is another, and there is some well-recognized but unexplained relationship between epidemics of measles and whooping-cough which predisposes those suffering or recovering from measles to contract this specific cough. The presence of any other diseases does not interfere with its acquirement. Some children are never infected though often exposed; a few cases occur late in life.

The lesions of whooping-cough are varying degrees of catarrhal

inflammation affecting the mucous membrane of the upper respiratory tract, especially the larynx and trachea.

Catarrhal enteritis and colitis are common sequels.

Incubation.—A precise statement of the period of incubation is impossible. It is safe to estimate the latent period from one to two weeks, but the onset is too gradual and the initial symptoms often too ill-defined to admit of greater accuracy. It is probable that here as in many other infectious diseases the incubation period is variable, depending upon personal systemic conditions and susceptibilities and perhaps upon atmospheric and telluric conditions as well. Usually, several days elapse before the peculiar characteristic whoop is heard. The infective period also varies from the very beginning of the catarrhal stage to the end of the spasmodic stage or cough. Quarantine should be insisted on for full three months.

Symptoms.—It is important to distinguish between at least two stages of whooping-cough, the catarrhal and the spasmodic. Sometimes a third more arbitrary stage is described, that of decline. The first—premonitory, catarrhal, or feverish—stage lasts a week or more. The child is “poorly,” with slight fever and a dry, ringing cough. The cough of this stage is not materially different from that due to simple catarrh, but occurs with more virulence at night, often keeping the patient awake and struggling to repress the disagreeable tickling sensation in the throat. Ordinary cough remedies have little effect in repressing this. In the daytime the child may be fairly well, perhaps with diminished appetite and not quite up to normal health. Auscultation of the chest reveals a condition of bronchitis, with a considerable number of bronchial râles, both dry and moist, but there is little evidence of secretion from the bronchi. Gradually the cough becomes more and more paroxysmal, and the child passes insensibly or gradually into the second or convulsive stage. At the end of the second week, or it may be only a few days, the characteristic whoop occurs; the cough returns in repeated paroxysms; the onset of the paroxysm is very sudden; a series of rapid expiratory coughs occur, these are at once followed by a short and distinct “whoop,” or long, noisy inspiration, then succeeds another series of expiratory coughs, similar to the first, followed by a louder “whoop,” and so on for three or four attacks, until the child is quite worn out. The attack frequently ends by severe vomiting. It may readily be seen how forty

or fifty such paroxysms during the course of twenty-four hours, many or most followed by regurgitation of food, will greatly exhaust the child, and as the disease continues for a long period, pertussis is rightly to be dreaded. As has been before stated, the termination of a paroxysm is denoted by eructation and vomiting of bits of food, stringy mucus, and sometimes small quantities of blood. During the coughing-fit the face becomes dusky and cyanosed, indeed all through this stage, owing to the frequent and severe coughing, the face presents a peculiar livid appearance and the eyes are swollen and watery. The duskiness of the skin is due to capillary congestion, and often there are extravasations of blood into the conjunctivæ, the whole conjunctival surface sometimes becoming blood-red. A sharp bleeding from the nose often accompanies or follows the paroxysm. After this stage of four or five, sometimes seven or eight, weeks the paroxysms grow less in number and severity, the "whoop" disappears, the lungs clear up, and convalescence is established.

Complications and Sequelæ.—The most common and dangerous complications of pertussis are bronchitis and bronchopneumonia. Atelectasis of a portion or the whole lung may prove a fatal complication in very young children, especially those of strumous or rachitic type. Occasionally pleuritis with effusion or croupous pneumonia arises in the latter stages, and empyema has been observed. Emphysema is not a very rare complication where the amount of coughing is great, but this usually passes entirely away. A much rarer complication and one fraught with sudden and great danger is edema of the glottis. A number of small grayish or yellowish-gray ulcers are frequently found upon the frenum of the tongue having small significance and bearing no relation to the severity of the attack. While vomiting is a symptom commonly present and usually ends a pronounced paroxysm of coughing, it may become of such frequency and severity as to endanger life by producing starvation. Chronic diarrhea, also, may be a late and stubborn sequel. A certain amount of hemorrhage from the lungs not infrequently accompanies the paroxysm in severe cases, but more often there is bleeding from the mouth and ears. Cases of true gastric hemorrhage, while very rare, have been seen. An effusion of blood may also take place into the meninges. Hemorrhage into the subconjunctival tissues is not at all unusual. Epistaxis frequently repeated tends to seriously deplete the sufferer. The nervous sequelæ of

pertussis are sometimes severe; convulsions, especially in young children, may cause death. Spasm of the glottis, aphasia, hemiplegia, and loss of vision quite often occur. During the attack of coughing involuntary passage of urine and feces may take place, and the kidneys, which during the disease are always in a state of considerable congestion, may possibly result in a true nephritis, parenchymatous in nature. This sometimes persists long after the disease itself has subsided. Cases have also been reported in which diabetes mellitus has followed the attack of whooping-cough. Glandular enlargements, particularly those of the bronchial glands, are not uncommon.

Diagnosis.—In the beginning it is practically impossible to differentiate whooping-cough from ordinary catarrhal states unless the whoop appears. When once this is established there need be no difficulty. However, in the absence of whoop, a prolonged severe cough and catarrhal state, with freedom from fever, the increments appearing at night and being of a spasmodic character emphasize suspicion.

Pathology.—The disease is probably of microbic origin. Afanasiew, in 1887, isolated a bacillus which he called the bacillus tussis convulsivæ, and other investigators have substantiated his opinion. The germ has been found principally in the mucus of the trachea. The immediate cause of the paroxysms of coughing is undoubtedly a supersensitive condition of the mucous membrane of the air-passages which is supplied by the superior laryngeal nerve. There are few pathologic changes in the various organs to be found postmortem. Those most commonly seen are due to congestions, especially in the lungs, heart, kidneys, and meninges. Occasionally after death patches of atelectasis or pneumonia are to be found in the lungs or hemorrhages into these organs.

Treatment.—The treatment of whooping-cough should be both local and systemic. The infectious principle enters by the upper air-passage, and hence carefully directed and persistently applied local remedies can be relied on to modify or check the disorder, and our experience encourages us to believe this to be a most important factor in treatment. Children can soon be trained to submit to the application of aseptic sprays and other local medications; even to welcome them for the relief they afford. Those who object should be persuaded or held in position for intubation advised by Dr. Walter Freeman. It is well to spray or douche the nose with a cleansing solution,

preferably alkaline and approximating the specific gravity of the blood, to which may be added various stimulating or astringent ingredients suited to the stage of the disorder or the local conditions of the mucous surfaces, repeating several times a day. This may be followed by oily sprays containing menthol or camphor. When relaxation is obvious astringents are indicated, of which alum is useful, in tincture of rose or pomegranate. Later iodine in glycerin is of value to alter the glandular action, applied on a cotton swab. Cocain and antipyrin, in locally weak solution, in an aromatic water greatly relieves certain cases. Cocain is not of much use, however. Extract of hamamelis is of value.

The length and severity of the spasm are greatly checked by inhaling a mixture of three parts chloroform, five parts ether, and $\frac{1}{2}$ to one part amyl nitrite. A few drops of this is applied on a handkerchief and held under the nose on the instant of coughing, and has proved of great service in our hands and never gave rise to any anxiety; indeed, has apparently saved life often. Internally the great remedy is quinin, preferably in solution, with hydrobromic acid. Thus is obtained both a local and systemic effect, and the dose is best given at frequent intervals of not less than two or three hours. If this does not suffice, atropin or hyoscin hydrobromate in a dose of $\frac{1}{100}$ to $\frac{1}{300}$ of a grain every two hours is of value. Bromoform is highly extolled by some. An opiate in the form of codein or Dover's powder checks coughing best at night.

To quote from one of us it is important: "First, to begin treatment as early as possible, especially with local measures. In certain instances I was of the opinion that beginning attacks were thus aborted. Second, it seemed of value to meet the toxin by small repeated doses of calomel with bicarbonate of soda or boric acid, or both, to expedite action of the kidneys. Third, the diet should be simple, carefully prepared, and given in small amounts at a time, so as not to overload the stomach or overtax the digestive capacity anywhere. If vomiting occurs, food should be offered soon after—a half-hour or an hour,—for very rarely it is accompanied by nausea; it is merely a reflex spasmodic rejection of food, and starvation is thus easily induced. For very considerable vomiting in older children I occasionally use small pills of cocain, $\frac{1}{60}$ to $\frac{1}{40}$ of a grain. Fourth, the local measures, as outlined above, must be promptly, thoroughly, and

frequently applied. Fifth, children afflicted with pertussis should live all day in the open air, adequately clothed. If the weather be exceedingly inclement they may play about in a room with all the windows open, clothed as if for the open air. Sixth, the question of climate is a relative one which can be met within four walls if the proper conditions are obtained. This can be accomplished by maintaining a proper temperature and relative humidity. Too great dryness, if artificial, is distinctly objectionable. Sometimes the seashore is best, but more often a wholesome piece of woodland will suffice, especially if it consists largely of the conifera. Dry, sandy soils are much better than alluvial ones, but there should always be an abundance of outdoor air both by night and by day, and as little as possible of fatiguing conditions, such as school tasks induce."

SYPHILIS.

Syphilis is a specific disease, probably of microbic origin, of slow evolution, engendered by inoculation (acquired syphilis) or by transmission from parents (congenital syphilis). In congenital syphilis (excepting only the primary sore or chancre) all features of the acquired disease may be manifested. Syphilis arising in infancy may, however, be acquired, possibly from a sore on the genital track of the mother, from lesions in the nurse or attendant, especially a mucous patch upon the mouth or lips.

A baby infected with syphilis may come into the world healthy looking or with obvious evidence of the disease; generally no symptom is shown until a month or more has elapsed. Syphilis may be acquired from the father or mother, or from both, infecting through the spermatozoa of the male or the ovum of the female. It is generally admitted that if infection arises from a double syphilization, from both an infected father and mother, the result is more disastrous to the offspring. There is the greatest danger from paternal transmission during the first year after primary infection, and it is possible up until the end of the fourth year. Early and thorough treatment greatly lessens the probability of transmission, but after a certain time this immunity is lost. A mother may bring forth a syphilitic child without herself giving evidence of having acquired the disease. Colles' law, well established, is that a mother bringing forth a syphilitic child

can not acquire the disease from the infant and, further, she is immune to syphilis from any source. If a mother be suffering from constitutional syphilis, the disease is transmitted in an unusually active form to her offspring. The degree of severity depends upon the stage of syphilization, character of the disease, and the nature of the treatment employed.

Symptoms of syphilis at birth are feebleness, malnutrition, usually certain skin eruptions in the form of bullæ about the wrists and ankles, and pustular syphilides on the feet and hands, ulcerated lips, nasopharyngeal catarrh, and enlargement of the liver and spleen.

Early Manifestations.—(1) Those cases which develop the disease at birth or very early after birth. (2) Those which develop it one or two months later.

(1) When the disease manifests itself early after birth the attack will be severer. In other words, the earlier the attack the graver the disease. The usual symptom group is emaciation, a severe form of coryza, and an eruption of blebs, particularly upon the palms of the hands and soles of the feet. Certain fissures and ulcerations appear on the lips, which are characteristic, and are a source of infection to wet-nurses. There are also signs of bony and visceral disease, disturbances of nutrition with consequent atrophy of all the structures of the body, and the infant presents the countenance of an old man. All this is due to the direct influence of the syphilitic virus. Skin eruptions are similar to those appearing late in the course of the disease. These children rarely survive long.

(2) When a syphilitic baby is born seemingly healthy without any sign of abnormality, it thrives well, or apparently so, and may remain thus for a month or two, when a nasopharyngeal catarrh usually develops, producing the characteristic snuffles and interfering seriously with the act of nursing. This catarrhal condition may extend to the Eustachian tubes or middle ear, and thus cause deafness. In the graver forms of syphilis the discharge may be seropurulent, evidencing ulceration; necrotic changes take place in the bones, with local loss of tissue, producing the characteristic flat nose of congenital syphilis. The protoplasm of children reacts readily to irritative processes, and the syphilitic poison produces extensive changes and ravages in the tissues; hence, the very remotest parts are affected and with a wide variety of phenomena. The skin lesions develop along with, or soon

after, those of the mucous membranes. One of the earliest is the eruption of small, round, or oval pink macules, disappearing on pressure and occurring upon the lower part of the abdomen or nates, spreading thence over most of the body. The color of the erythematous rash has a tendency to become like that of copper, and yet the resemblance to a simple erythema is very close. Usually there is little or no scaliness, except at times on the hands or feet; at others this eruption tends to grow worse, showing moist, infiltrated patches, closely resembling eczema.

A papular syphiloderm usually accompanies the erythema in the shape of small, dull, red papules running together. When lesions occur near the mucous orifices, especially about the anus and commissures of the lips, condylomata may result and are highly contagious. There may form also rhagades or linear scars radiating from the mucous junctures. Pustular syphilodermata begin as early as the eighth week, but usually later. The pustules may be large, numerous, and deep, or few and small, varying with the severity of the case. The site selected is the face and buttocks, the lesions resembling impetigo or pustular eczema. The syphilitic pustules or crusts are dark, thick, and greenish, forming deeper ulcerations than impetigo, and the itching of eczema is absent. Occasionally a furunculoid eruption occurs, especially in ill-nourished children, the lesions beginning as small nodules in the corium, increasing greatly in size, throwing off irregular sloughs, and leaving unhealthy cavities and resulting in cicatrices. Bullous and tubercular eruptions are seen occasionally in syphilitic children (pemphigus), the skin showing at first a violaceous patch; soon after vesicles appear, becoming confluent, running together, and growing larger.

The viscera are apt to be more extensively involved in the congenital than in acquired syphilis. The lesions are less likely to be gummatous than interstitial, the hyperplasia being more or less diffuse. The interstitial connective tissue, in the process of overgrowth and subsequent contraction, shrinks the parenchyma. The lung, or a portion of a lobe, may present a profuse fibroid infiltration. The spleen is usually more or less enlarged and the capsule thickened. The liver, not seldom, is enlarged and hardened from a profuse sclerosis; an interstitial orchitis may affect one or both testicles, producing a hardening and enlargement of the glands. General nephritis is an

occasional intercurrent. There are two principal ways in which syphilis affects the bones in early life, usually the long bones,—the one producing changes at the junction of the shaft (diaphysis), the other attacking the periosteum. Osteochondritis, a purely syphilitic affection, is an inflammatory process occurring at the juncture of the epiphysis with the diaphysis, checking the normal growth of the bones and thus producing deformity. Periostitis is more likely to occur after the child has begun to walk. Syphilitic dactylitis is often seen in young children, the phalanges and the metacarpal and metatarsal bones being enlarged to several times their natural size. These may break down and form abscesses. Craniotabes, often present, a thinning of areas of the cranial bones, is the product rather of malnutrition, whether due to syphilis or rickets; it especially affects the occipital bone, since that one is more commonly pressed upon in normal decubitus. In proportion to the severity of the syphilitic poison is nutrition disturbed; in all cases it is much impaired. In the infant the typical appearance is that of a weazened, pallid old man. Such cases are likely to die. Oftentimes nutritional failure is more gradual, due to specific disturbance in the organs of digestion or mere cachectic feebleness. The blood always suffers more or less anemia; being deficient in red corpuscles, there is also a marked leukocytosis. This anemia is of the utmost gravity and significance, and may alone, and directly, cause death. Two other diseases are mentioned common to childhood, in which similar lesions of the blood appear, and these are splenic anemia and severe forms of rachitis. In hereditary syphilis, and in rachitis as well, the deciduous teeth are tardy, appearing in the tenth or twelfth month, or later; they are usually poorly developed and decay early. There is small involvement of the nervous system in infantile syphilis, the nerve-centers escaping rather remarkably. Apparent paralyses often accompanied by tenderness of the joints are occasionally seen which are more likely to be due to myopathic changes; from whatever cause they arise, they readily succumb to specific treatment, and almost never persist. This syphilitic false palsy is an acute epiphyseitis and may be one of, or the first symptom of the disease. The nails are subject to two kinds of syphilitic disturbance,—ulcerative, from a pustule appearing on the margin of the nail, which may destroy the matrix, and the nutritive, coming on more slowly and involving the phalanx. A general irritability is described but does not differ from that of rickets.

Diagnosis.—The diagnosis of syphilis is not so difficult where the lesions are well marked and characteristic, or if there is a reasonably honest or clear history to be obtained, or if there be an opportunity to study the case with sufficient deliberation. Marks of the disease upon the parents are rarely obtained. A history of causeless abortion in the mother is suggestive but requires thorough sifting. This is said to occur usually at or about the sixth month of gestation. The appearance of the child before the disease shows itself clearly may tell little, but the most characteristic features are those of impaired nutrition, generally without digestive disturbance, and a loss in the normal appearance of the skin, its normal freshness, acquiring a shriveled look with pallor and yellowness like coffee with milk. This is especially seen in the face, though it extends to the rest of the body. A persistent coryza, however slight, should be viewed with suspicion. Mucous patches can generally be found, commonly about the anus, scrotum, umbilicus, in the axilla, mouth, and ears; but in children these may appear over almost any part of the surface. The mucous patches are liable to become the seat of an ulcerative process, especially the mouth and throat.

The following points of distinction between syphilitic and scrofulous lesions of the skin have been given by Dr. P. A. Morrow:

“(1) Syphilitic lesions are general in their distribution; they may occur upon any region of the body. Scrofulous lesions are more limited in their localization; they have a special predilection for the neck or regions rich in lymphatic glands.

“(2) Syphilitic lesions are ambulatory and changing; they disappear and reappear elsewhere. Scrofulous lesions are fixed and permanent.

“(3) The color of syphilitic lesions is reddish-brown or ‘lean-ham’ tint. The color of scrofulous lesions is brighter and more violaceous in hue.

“(4) Syphilis is distinct from scrofula in its objective appearance and mode of evolution. In the initial stage the syphilitic neoplasms are firm and hard; the scrofulous infiltrations are softer and more compressible. In the ulcerous stages the differences are more pronounced; the ulcers of syphilis are cleaner cut, regular in contour, with perpendicular, firmly infiltrated borders encircled by a pigmented areola. Scrofulous ulcers are irregular, with soft, undermined bor-

ders; they are painless, bleed easily, and show slight tendency to spread.

"(5) The crusts of syphilis are bulkier, thicker, with a tendency to accumulate in layers, and darker in color; the cicatrices are smooth and remain long surrounded by a pigmented areola. The crusts of scrofula are softer, more adherent; the cicatrices are elevated, irregular, bridled; they retain their violaceous color for a long time.

"(6) The course of a syphilitic ulcer, though sluggish and chronic, is much more rapid than that of scrofula.

"(7) Absence of pain and local reaction characterize both syphilitic and scrofulous ulcers; they are essentially lesions without symptoms."

In connection with the bony lesions it is important to diagnose between syphilis and tubercular and rachitic affections. The following points in diagnosis between syphilis and tuberculosis are given by Dr. Morrow:

"(1) Syphilis exhibits a marked predilection for the long bones; its habitual localization is in the diaphysis, and almost always at its terminal extremity. Tuberculosis is almost exclusively situated in the epiphysis, rarely affecting the shaft.

"(2) In syphilis there is a marked enlargement of the bone by more or less voluminous osseous tumors or hyperostoses, with little or no involvement of the soft parts; and in tuberculosis the tumefaction is due less to increase in the size of the bone than to edematous infiltration of the soft structures.

"(3) In syphilis there is little tendency to suppuration and necrosis; in tuberculosis the pyogenic tendency is marked.

"(4) In syphilis osteocopic pains with tendency to nocturnal exacerbation are pronounced features; in tuberculosis the pain is dull and heavy, not aggravated at night; sometimes there is entire absence of acute painful symptoms.

"(5) The osseous lesions of syphilis rarely react upon the general system, while those of tuberculosis often determine a marked impairment of the general health, grave complications, hectic fever, cachexia, etc."

In syphilitic dactylitis there is little involvement of the soft parts, the swelling being caused by the enlargement in the size of the bone. In tubercular dactylitis the swelling is due more to an edematous infil-

trated condition of the soft tissues than to enlargement of the bone. In the latter cases breaking down of the tissues and ulceration are more apt to ensue.

The diagnosis between syphilis and rachitic bone-lesions may become of great importance. Epiphyseal swellings occurring under six months are apt to be syphilitic. In syphilis the epiphyseal swellings may be unilateral, but it is always symmetric in rachitis. In doubtful cases the swelling must be subjected to specific treatment. It is well to remember, however, that rickets and syphilis may coexist in the same case. There is almost invariably enlargement at the costochondral articulations in all cases of rickets, which is absent in syphilis.

Prognosis.—Above one-third of fetuses affected with syphilis die before birth, and about the same proportion of those born alive perish inside the first six months. The earlier the symptoms appear after birth the severer will the type of the disease be and the worse the prognosis. If the digestion remain good and the food-supply wholesome as in those provided with good breast-milk, the infant may grow up and thrive. The better the circumstances of hygiene and environment, the better the chances for full recovery. A severe coryza interfering with blood aëration exerts a very destructive effect and demands careful treatment.

Late Manifestations.—Children with congenital syphilis sometimes fail to give evidence of the infection, and the ordinary symptoms, as seen in infancy, escape attention. Later, however, characteristic lesions appear, or the disorders become manifest in certain developmental defects involving the teeth, the bones, the genitalia, and, indeed, are widely extended but are not always or all to be unreservedly ascribed to syphilis. In those instances, too, where the disease has been recognized and placed under proper treatment, and the symptoms have disappeared, the little one fails to develop like other children. Growth is slow and inadequate, and there are facial and cranial characteristics which often render the disease recognizable at a glance. A young man or woman may be neither bigger nor look older than a boy or girl of ten or twelve. The organs of generation particularly suffer, but the other organs are small and inefficient, and the vitality of such sufferers is low. The characteristic face is familiar to all medical students; the lusterless skin, prominent forehead, asymmetric skull, the depressed bridge of the nose, prominent lips with

striated lines running from the corners of the mouth, the peg-shaped central incisor teeth notched in the middle, the eyelids inflamed at the edges, spotted or hazed with cicatrices on the cornea—is a picture familiar in all clinics. Evidences of syphilis obtrude themselves at two periods,—the time of second dentition and at puberty. The most graphic feature is the peculiarity described by Mr. Hutchinson, affecting the central upper incisor teeth, the significance of which has, however, been unduly exaggerated. This consists in the loss of the central cusp, causing a cupping or “crescenting” of the cutting edge, and also a narrowing at this edge, the base of the tooth being wider, and the tooth is usually described as “peg-shaped.” The cause of this is said to be a defective growth within the alveolus, or to early infantile stomatitis or alveolar periostitis. There may also be a change in the shape of the palate, which usually has a very high arch, and ulcerative changes take place here and in the nasopharynx, which result in shrinkage and, later, deformity. Large, indolent, mucous patches may occur upon the gums and tongue, continuing out upon the lips and cheeks, especially at the corners of the mouth, leaving long, striated scars. One of the commonest and most important changes is due to a periostitis, involving various long bones, with thickening upon the surface of the bone, inducing changes in its form. These are occasionally unilateral, though usually symmetric and attended with little discomfort, aside from occasional nocturnal pains. The nasal bones may be affected to the destruction of the bony arch of the nose, and result in the well-known flattened bridge deformity. About the time of puberty the eye is liable to a peculiar form of inflammation, an interstitial keratitis, producing opacity of the cornea without much disturbance of the conjunctiva; along with this may coexist an iritis of an indolent kind, yet lacking the severe pain and sensitiveness to light seen in other forms of inflammation of the iris. The corneal opacity may obscure this, as well as other deeper-seated troubles, as choroiditis and retinitis. The ear is subject to inflammatory affections from which rapid deafness sometimes results, in spite of all treatment. Visceral disturbances occur, and both the spleen and the liver may become enlarged, alone or together. A number of changes take place in the genital organs; in younger children the testicles are sometimes enlarged, accompanied by hydrocele, and this may involve both the epididymis and the cord, and work destructive changes.

Many times the only evidence of syphilis in early years is mere arrest and perversion of development; the testicles may be very small and inefficient, and in girls the mammary organs fail of development and menstruation is liable to be delayed and inadequate; not seldom such cases develop epilepsy.

Treatment.—In the management of infantile syphilis the possibilities of prophylaxis are large if the parents seek timely advice. As illustrating what can be done, the following instance will be suggestive. One of us had under treatment a gentleman with fully developed syphilis which soon became moderately controlled. The mouth presented abundant mucous patches, slowly healing, and in flat defiance of our advice he married a perfectly healthy woman. He followed our advice in other respects, which was to subject his wife, as well as himself, to systematic treatment, and they each took protiodid of mercury in pill form, which was selected for convenience, and continued for at least a year, at about which time a child was born which we kept under observation for between two and three years, without the slightest symptom showing in mother or child. This may have been a perfect result, or developmental defects might have shown themselves later. Had more thorough supervision been allowed, perfect prevention might have resulted. It must not be lost sight of that the infant may contract syphilis *de novo* from a parent or other source of infection.

In the treatment of the syphilitic infant it is necessary to use specific medication, and along with this, conscientious attention to nutrition. Mercury in some form is certainly the best remedy. Internally it may be given to the mother, and through her milk the child is more or less affected; for the medication of the child direct, mercury is best given by inunction, although in this form it occasionally disagrees; or internally, when it is much more likely to disagree; or both, or alternately. This treatment at times must be omitted for a few weeks, and iron and cod-liver oil and other tonics substituted. The form for inunction may be the mercurial ointment, diluted, if necessary, where the skin is oversensitive, or in its full strength and freely where it is necessary to produce a prompt impression; and, indeed, it is important that no time should be lost in impressing the system with the drug. A ten per cent. solution of the oleate of mercury, of which five drops are rubbed in three or four times a day is an excellent and cleanly form. Unguentum hydrarg., one part, and lanolin and cold

cream, of each two parts, is preferred by some. This should be smeared on a flannel bandage and applied about the abdomen, or rubbed in on the inside of the thighs or axilla, every day, using about a dram each time. Before using the external applications it is important that the skin be thoroughly cleansed with soap and warm water. Internal medication, on the whole, is more accurate and satisfactory, and various forms of mercury are recommended, in some cases the iodids also, but strict care should be taken to keep the mouth perfectly clean, or stomatitis will result. The indications and doses depend to a great extent on the locality or organ affected,—whether the skin, mucous membrane, lymphatic glands, muscles, blood-vessels, bones, viscera, nervous system, or the sensory organs, and upon the time at which the first symptom became recognized.

Internal medication consists at first of the various mercurial preparations, and later of iodids and tonics. Osler, quoting from Hutchinson, uses the gray powder, mercury with chalk, from $\frac{1}{15}$ to $\frac{1}{2}$ of a grain, four to six times a day, guarded, if necessary, by a little Dover's powder. We have seen these results of Osler's, and know them to be brilliant. Jacobi recommends small and frequent doses of calomel, $\frac{1}{20}$ to $\frac{1}{8}$ of a grain three times a day, for months in succession. If diarrhea occur, he adds to each dose $\frac{1}{20}$ to $\frac{1}{12}$ of a grain of Dover's powder. Bichlorid of mercury is advocated by many; Van Swieten's liquid has enjoyed a large reputation and still has many advocates. This consists of bichlorid of mercury, one part; water, 950 parts; rectified spirits, 100 parts; five to twenty drops in milk three times a day. Baths of mercuric chlorid are also useful, the child being placed in the following bath for fifteen minutes: Mercuric chlorid, four grains; ammonium muriate, six grains; water, 2500 grains. Or bichlorid of mercury may be given in various combinations, from $\frac{1}{200}$ to $\frac{1}{80}$ of a grain, twice or thrice daily. A good menstruum for this, especially if intestinal irritation ensue, is elixir of pepsin or elixir of bismuth. The mercurial treatment should be continued for about one year, longer if symptoms persist. The doses should be gradually lessened after six months. The treatment is similar for those cases of infants and children who have acquired syphilis; this may come about (Jacobi) by the ritual sucking out of the circumcised prepuce, the syphilitic nipples of a mother or nurse, kissing, the use of infected instruments, and, in older children, sexual contact. The acquired form

of syphilis in infancy and childhood is apt to run a swifter and more deleterious course than in adults. Where it becomes necessary to check the ravages of syphilis at once, mercury should be given subcutaneously; and here calomel is not so well borne in children as the bichlorid of mercury, one to two grains in an ounce of distilled water, from $\frac{1}{100}$ to $\frac{1}{50}$ of a grain twice daily. Where the bones and glands suffer it is well to add to the mercury potassium iodid, two to five grains, four times a day, in milk or alkaline waters. Children bear the iodids in full doses remarkably well. Under all circumstances the treatment must be persisted in for many months after the disappearance of the symptoms.

The constitutional disorder may break out in one of many ways, producing otitis, a caries or sclerosis of nerve tissues, affecting the brain or spinal cord, or a meningeal exudation. Gilbert's syrup consists of the biniodid of mercury, three grains; potassium iodid, 200 grains, water, three ounces, and syrup, enough to make ten ounces. Dose for a child under three years, five to ten drops, gradually increased. The use of mercurial fumigation is advocated by some. The local treatment of mucous patches, excoriations, and especially of the coryza is very important. The nose should be kept clean by a wash, such as Dobell's solution, or boric acid in solution; so, also, to the mucous patches, and other, as astringent remedies applied. A two per cent. solution of Squibb's oleate of mercury is useful to the nose, or fifteen grains of calomel to the ounce of liquid petroleum applied to the nose or condylomata, or these last may be dusted with calomel alone or with calomel and boric acid. Nitrate of silver is of value for indolent lesions and mucous patches in the mouth or genitalia. Often sluggish symptoms, such as lymphadenitis, or pulmonary infiltrations where there is reason to suspect syphilis, will yield most promptly to mercurial treatment, even though it be not certain that these arise from syphilis any more than from scrofula or tuberculosis. It must be borne in mind that mercury as well as the iodids have a tonic effect upon syphilitic individuals, and may be continued along with other tonics, of which iron is the chief.

A very large measure of attention must be given to the general health of such suffering children who are peculiarly feeble and deficient in resistance. This subject is elaborated in the chapter dealing with the subject of development.

Syphilitic ulcers should be cleansed, then cauterized by silver nitrate and covered with mercurial plaster. For stubborn syphilitic affections Ullmann recommends electric mercuric-chlorid baths. The baths are to be from thirty to forty minutes, the electric current to be passed through the bath from 100 to 200 Ma. Thyroid extract has been highly recommended. Menzies reports four cases of malignant syphilis which he treated by the thyroid extract, no other remedy being used. He had noticed an improvement in all the cases. From this he concludes that the remedy is a powerful skin tonic and a useful adjuvant to mercury and potassium iodid in the treatment of syphilis.

Türbringer has called attention to the fact that during mercurial treatment syphilitic patients develop nephritis. Out of 100 cases eight had developed albuminuria in consequence of the absorption of mercury. Some believe that nephritis is due to the use of insoluble preparations of mercury; the treatment in these cases is to be discontinued, and during a long mercurial course examination of urine is not to be lost sight of. All sufferers from syphilis require watchfulness for years, and carefully selected food, tonic, and nutritive stimulants used.

MEASLES.

Synonyms.—RUBEOLA, MORBILLI.

Measles is an acute infectious and highly contagious disease characterized by fever and coryza followed by the appearance of a distinctive maculopapular eruption on the face and portions of the body. It occurs in widespread epidemics of variable virulence and extent, recurring every two years or eighteen months. Its spread is so rapid and universal that during an epidemic few of the youthful members of a community escape. It is especially noteworthy that in communities which for a long period have been free of epidemics the course of the disease is marked by great fatality; for instance, the savages of New Hebrides were decimated in a remarkably short time by an epidemic of measles originating in a mild case of an English sailor on board a trading vessel. In civilized regions, however, where the disease is frequent, the mortality is relatively small, practically nothing among the children of the well-to-do, whereas the poorer and badly nourished children of lower classes

suffer more seriously. Age seems to prescribe no limit to an attack, even infants being born with a distinctly visible rash.

The febrile incubation may be as long as fourteen, even twenty-two days, ten being perhaps the average, the invasion of three to five days presenting symptoms of an acute coryza. Measles is most highly contagious, and it is said the disease may be "taken" from another at any time after the moment of the inception of the infection. The contagium, however, does not cling to objects so tenaciously nor so long as does that of scarlatina; indeed, after desquamation and possibly before the end of it the virulence ceases.

Symptoms.—The first manifestations of the attack are a marked coryza with a hard, dry, and sometimes croupy cough. This cough may exist for a week or more before other symptoms show. A whole day or more before the appearance of the eruption the fauces may be seen to be greatly reddened and injected and covered with a distinct rash. This papular eruption of the fauces is a valuable feature in diagnosis. Koplik draws attention to certain bluish-white spots situated on a red base seen on the mucous membrane of the lips and cheeks. These are observed as early as seventy-two hours before the appearance of the eruption. The tongue is coated a dusky "raspberry" red, and though supposed to be distinctive this can not be relied on. Accompanying the coryza is great drowsiness, headache, redness, and watering of the eyes, and sharp injection of the conjunctiva and usually a cough. The throat will often be sore with moderate congestion of the tonsils, fauces, and larynx. The temperature rises in the evening and falls in the morning. After about four days of these prodromal symptoms the characteristic eruption becomes manifested. It occurs first back of the ears, at the roots of the hair, but rapidly spreads over the face and neck which is the principal seat of the eruption. It is usually discrete, but may become confluent in severe cases. A bran-like desquamation follows. The rash is so characteristic that in conjunction with the coryza, cough, and injection of the cornea, a diagnosis of measles should not be difficult, though error is permissible in view of the variations which always occur in the eruptive and general symptoms of a specific fever. The erythema consists of groups of dusky red, "crimson" papules surrounded by discs of a brighter red which offer strong contrast to the intervening spaces of normal skin. The papules are hard,

though not so "shot-like" as to become confused in ordinary cases with the papule of variola. Frequently the papular areas combine to form a crescent, and this crescentic appearance of the group offers a differential point between the rash of measles and scarlatina. Moreover, the papule of scarlatina is a brighter red, smaller, petechial, and is not raised above the surface. In some serious cases the rash becomes hemorrhagic "black measles"—an evil sign. The maximum temperature is usually coincident with the greatest profusion of the rash. During the stage of eruption the temperature gradually falls to normal. If after the fourth or fifth day from the beginning of the eruption the pyrexia still persists, some complication, most commonly bronchopneumonia, should be suspected.

Like all the other exanthemata, measles is apt to vary in respect both of virulence and the character of its general manifestations. The typical case is marked by a greater or less degree of pyrexia, by its own peculiar eruption, and by a catarrhal affection of the respiratory tract. Sometimes one or another of these symptoms may be greatly exaggerated, or, on the other hand, almost totally absent. In the milder cases the eruption may be quite obscure, and the catarrhal phenomena slight, while in the more malignant forms the eruption is darker, more "angry," and the coryza may develop into a severe form of bronchopneumonia which calls for vigorous treatment on its own account. In these severer cases the eruption is apt to be dilatory in its progress, "suppressed" or "struck in," and makes its appearance at irregular intervals and on various parts of the body. Frequently the child has been manifestly ill for several days with bronchopneumonia, and then the rash appears on the buttocks, for instance, which is so often the seat of various eruptions in childhood, thus greatly embarrassing a clear diagnosis of measles.

The more serious of the sequelæ of measles arise out of the coryza and the consequent inflammation of the respiratory passages. As already stated, the bronchopneumonia is the most frequent and indeed the most dangerous complication; membranous laryngitis also not rarely occurs. During the process of these complications the glands in the neighborhood of the lesion, especially the small mediastinal glands, are apt to become overloaded with the effluvia of inflammation; swelling and induration result, and there gradually sets in a caseous degeneration of the gland. In unhealthy scrofulous children this con-

dition often leads to cold abscesses, scrofulous ulcers, and many of the forms of lung disease, notably miliary tuberculosis. Other complications are diarrhea and marasmus. The former is more of the nature of acute dysentery, while the latter has been recorded as occurring in a number of cases of infants and very young children. Where the pyrexia continues, the eruption is fitful, and there is at times a condition of ulcerative stomatitis. It may be said, as a general rule, that measles do not recur after the first attack, but there is no doubt that a relapse may take place, and there may indeed be, and often is, a second genuine infection after a period of one or more years.

Pathology.—Investigation has thus far revealed but little light on the morbid anatomy of measles. In the urine and also in the blood-serum and in leukocytes micrococci have been found—facts which argue the need of further researches as to the etiology of the disease.

Diagnosis.—Being of slow onset and almost uniformly preceded by symptoms of marked disturbance of the respiratory tract, there should be little difficulty in differentiating between measles and scarlatina, the latter being of sudden onset and presenting the rash after the short period of twenty-four hours. To differentiate by means of the rash is often rather difficult; in typical cases of the two diseases there should be no confusion, but, as intimated before, the form and nature of the erythema in infectious fevers greatly vary.

Complications and Sequelæ.—Complications are rare over four years of age. The commonest is bronchopneumonia, and next comes intestinal derangements. Mild catarrhal laryngitis accompanies most cases, membranous laryngitis not so rarely. A certain amount of pneumonia is found in nearly every fatal case. In certain epidemics pleurisy is a frequent accompaniment. A true diphtheria may accompany and is a deadly complication.

The heart is occasionally attacked,—rarely, it is said, but we have seen some notable instances of severe involvement. Measles may be complicated by almost any other of the infectious diseases, one developing as the other subsides.

Treatment.—Prophylaxis is of far greater importance than the laity are inclined to think. Upon the first symptom of measles the patient must be put to bed and screened from the light, remaining there until all traces of the eruption have disappeared, which is usually at the

end of a week or ten days, and the child should remain in the same room till the end of the fourteenth day, at least. One more week should be spent indoors, and at the end of the third week, weather permitting, an outing may be cautiously allowed. The temperature of the sick-room should be 68° or 70° F., a little warmer than for scarlatina. The bed occupied should have a mattress of hair and be surrounded by a screen; the coverings should be light and only moderately warm. The air of the room should be kept constantly fresh and moist. Drafts can be avoided by a cheese-cloth screen placed immediately in front of an open window. While the photophobia lasts the room should be darkened moderately, and the patient's face turned away from the source of light. Mild cases require only general hygienic measures suitable for any febrile disease, with strictly regulated diet as to amount and hours of feeding. The tendency is for catarrhal states of the digestive organs to coexist or follow, especially aggravated by coarse articles of diet or by overfeeding or the use of laxatives. The quantity of the food should be reduced to that suitable for a younger child, and it may be fed a little oftener than in health, and it should be altogether fluid. Milk, the chief item, should be more than ordinarily guarded by alkalies and diluents to prevent the formation of tough coagula. If gastric irritation sets in, meat juices, soups, and egg-water should be substituted in small amount, and at shortened intervals. Plenty of water is to be allowed, but not in too large draughts at once, preferably administered in a small vessel holding only an ounce or two. It is well at the beginning to secure a cleansing of the bowels, and a simple laxative, such as castor oil or calomel, may be used with caution, but an enema is usually sufficient because of the tendency to diarrhea. It is well, also, to make sure of skin activity at the outset, by warm baths repeated once or twice a day until the eruption shows itself abundantly on the surface. Throughout the course of the disease it is especially important to watch and treat the catarrhal tendency which involves the digestive tract (as has been said), the respiratory organs, the eyes, and the ears.

If the eruption is distinctly delayed or retrocedes, some complication is to be feared and the skin demands stimulation by local applications, such as heat to the chest, abdomen, and above all to the feet and legs, which last may be sufficient. If the difficulty be very marked, and inflammation of the internal organs feared, hot baths or packs and

stimulants are required. At the height of the eruption the temperature may go up to 105° without aggravating the other symptoms or signifying anything serious, unless unduly protracted, when cool baths should be employed at 90° or 95° F. If the cool bathing seems to prostrate, it is well to promptly follow it by alcoholic stimulants and external heat. Quinin is the safest antipyretic, preferably given by suppository, two to four grains every four hours for a child of ten; one-fourth of a grain for a child of two. Few medicines are required: For the fever, liq. ammoniæ acetat.: or, if the cough be troublesome, liq. potass. citrat., every two or three hours, to which may be added syr. of ipecac, five or ten drops, or ten or twenty drops of paregoric, or both. If the bronchial catarrh be moderate, it may be let alone; if severe, or if bronchial pneumonia sets in, the treatment should be prompt and efficient—carefully applied counterirritation and stimulating expectorants as described elsewhere. (See Bronchopneumonia.) Oxygen may be necessary if the pulse grows feeble or cyanosis becomes marked, along with cardiac stimulants, among which iodid of potassium must not be forgotten. For the eyes a cleansing wash, such as boric acid fifteen grains to the ounce, to which may be added, in extreme photophobia, half a grain of cocain. The nares and pharynx, if markedly catarrhal, can be cleansed by the same means, and subsequently applications made of glycerole of tannin. Great care must be exercised during convalescence, the heart and kidneys must be watched and attention given to traces of bronchial and other catarrhs. Skin cleansing should be careful and thorough, and during the process of desquamation soothing ointments are of value, of which boric-acid ointment is among the best. If the itching be great, to this acid. carbolic. or resorcin may be added, but carbolic acid is not altogether safe over very large surfaces. Malignant measles require powerful stimulation and abundant tonics, especially quinin, digitalis, carbonate of ammonium, and mustard baths, along with brandy or hot coffee.

RUBELLA.

Synonyms.—GERMAN MEASLES, RÜTHELN.

Rubella is a very mild member of the group of infectious fevers, characterized by a slight rash and a condition of general malaise

lasting for a few hours or two or three days. As far as external appearances go the disease would seem to be of a somewhat variable character possessing points of similarity to both measles and scarlet fever. It is, however, a separate entity, as an attack of rubella does not protect either from measles or scarlet fever, although it generally occurs but once in a lifetime. Nor does an attack of either measles or scarlet fever confer immunity against rubella.

Causes.—The origin of rubella is no doubt bacterial, and there are those who seek to account for its frequent resemblance to measles and scarlatina by holding that its cause is a hybrid product of the infectious principles of these two more malignant affections. There may, indeed, be some truth in this, however,—much as it may lack scientific confirmation.

The two generally recognized forms of rubella, namely, rubella morbillosa and rubella scarlatinosa, are supposed to be variations from the typical disease, in that the epidemic is influenced in its phenomena by the coincident existence of an epidemic of scarlet fever or of measles, the rubella taking on some of the characteristics of whichever one may be prevalent at the time. The disease occurs usually in epidemics, although sporadic cases may be found. It is of somewhat rare occurrence, does not always admit of unquestioned diagnosis, and demands great attention owing to its unfortunate resemblance to the two more serious diseases before mentioned. Measles and rubella bear practically the same apparent relation that exists between variola and varicella. Much harm results from a hasty dismissal of alarm by pronouncing an ailing child a case of "merely German measles," while in reality the child is suffering from measles or scarlet fever, very serious diseases and accompanied by damaging complications and sequelæ. Adults seem at times almost as prone to attacks of rubella as children, though the symptoms are more marked in the latter. One attack engenders a degree of immunity, but an evidence to its own right to a place among the specific diseases is shown, as has been before stated, in the fact that it grants no immunity with respect either to measles or scarlatina, nor, on the other hand, do these afford security against a subsequent attack of rubella (Griffith). In a doubtful case strict isolation should be promptly enforced.

Incubation.—The period of incubation is variously estimated at from one to three weeks. There is some uncertainty as to this, but the average time may safely be stated at about two weeks.

Symptoms.—There are generally few or no premonitory symptoms. Occasionally, however, the patient will complain of some slight headache, pain in the back, sore-throat, and coryza, and in some cases nausea and vomiting. Very frequently the appearance of the rash is the first symptom noticed. There is often swelling of the cervical glands along the posterior margin of the sternomastoid muscle. The rash is usually of a more rosy-red than that of measles, and the papules are ill-defined. There may be simply a rosy blush; the confluence of papules and erythema may give rise to a suspicion of scarlatina, but the rubella rash is not so clearly punctiform as that of scarlet fever. The amount of fever is usually small, indeed, the attack being almost devoid of any rise of temperature. In the majority of cases, however, a rise of from 99° to 100° is noticed, very rarely to 101° or 102° . The temperature returns to the normal as soon as the rash disappears. Some hyperemia of the conjunctiva and fauces is frequently noticed, but is neither so common, prolonged, nor severe as in measles. The most distinctive feature is the affection of the lymphatic glands which show a widespread, almost universal, enlargement, quite different from the localized adenopathies of scarlatina or diphtheria. Measles show little or none; in scarlatina the glands and interglandular tissue below the jaws are the parts affected.

The **prognosis** is most favorable. Quarantine should be observed for at least three weeks. Complications are rarely seen, and in very severe cases only.

Diagnosis.—In epidemics there should not be so much difficulty in establishing a correct diagnosis. In isolated cases mistakes are liable to occur, and rubella may be erroneously taken for any of the erythematous affections so common to childhood. The rash varies so widely in appearance that this alone can not be relied upon as a guide. Inasmuch as there is no positively characteristic symptom of rubella, there is often much confusion in properly differentiating rubella from measles. The rash of measles appears after the fourth day of prodromal symptoms, while in rubella there are practically no prodromes. In scarlet fever the rash is usually preceded by malaise, vomiting, and sore-throat. The temperature can always be taken as an important

indicator in determining diagnosis. In rubella it is not uncommon for the patient to maintain a normal temperature, or, at the most, to suffer only a slight degree of fever. As an aid to the differential diagnosis of the various infectious diseases, we give the following table which has been taken from the admirable text-book of Rotch :

	VARIOLA.	VARICELLA.	SCARLET FEVER.	MEASLES.	RUBELLA.
Incubation	12 days.	17 days.	4 days.	10 days.	21 days.
Prodromata	3 days.	A few hours.	2 days.	3 days.	A few hours.
Efflorescence	Macules. Papules. Vesicles. Pustules.	Vesicles.	Erythema.	Papules.	Papules.
Desquamation	Large crusts	Small crusts.	Lamellar.	Furfuraceous.	
Complications and sequelæ	Larynx. Lungs.		Kidney. Ear. Heart.	Eye. Lung. Tuberculosis.	

Treatment.—Rubella requires no particular treatment and possibly no medication, but it should always be borne in mind that an exanthem can not be ignored, and care must be exercised lest some accidental exposure or state of exhaustion react unfavorably upon the blood or the vital organs. We have seen many cases of this disease, and some of them caused much concern. During the stage of eruption the bed is the only safe place, or at least a uniform atmosphere in one room. The diet should be exceedingly simple, and abundant water be drunk; the skin properly protected, at least until desquamation is completed. The throat is generally uncomfortable, which is to be relieved by the antiseptic alkaline spray through the nostrils, followed up by vaporized petroleum, to which some aromatic may be added, as camphophenic or menthol. Conjunctival irritation is sometimes present, when an antiseptic wash may be needed as boric acid, fifteen grains to the ounce of distilled water, and if pain, a small amount, as from one-half to one grain of cocain added. The bowels should be kept open.

THE BUBONIC PLAGUE.

Synonym.—MALIGNANT POLYADENITIS.

The outbreak of this dangerous affection, which raged in India so recently (1897), naturally enough causes a desire in other localities, however remote from the scene, to learn something, if only in a general way, about its characteristics. This disease has received various names at different times. In 1856 it was known in Tripoli as "typhus with glandular swelling"; in the same year in Chios it was called "petechial typhus." In Mesopotamia, where the disease was prevalent from 1856 to 1885, and possibly at the present day, it received the titles "adynamic typhoid fever" and "intermittent fever with glandular swellings." In Persia, where the plague seems to be endemic since 1863, it is known as "hemorrhagic fever." During the years 1877 to 1889, Astrakhan, a Russian province, was visited by this disease, which was described as "intermittent fever with buboes," "croupous pneumonia with buboes," "typhus with glandular swellings proving fatal with pneumonia," and a "peculiar form of mumps."

Plague, or malignant polyadenitis, may be defined as: An acute febrile disease of an intensely fatal nature, characterized by inflammation of the lymphatic glands, marked cerebral and vascular disturbances, and by the presence of a specific bacillus. At the present day the plague is confined to Asia, but since 1850 it has appeared in Europe, Asia, and Africa. The Mediterranean basin and the strip of country running parallel to that sea across the Asian continent, from Turkey to China, may be taken as its present habitat during the nineteenth century. The prodromata of the affection may appear before an outbreak, during a period varying from a few weeks to several years, as buboes with fever, in a more or less epidemic form. This disease is undoubtedly contagious, but the intensity of its virulence is greatly modified by free ventilation and attention to hygienic rules. The localities in which the disease seems to be endemic may be accounted for by the fact that they have been subjected to a miasmatic infection along with conditions of poverty, overcrowding, and neglect of the common hygienic precautions.

Among the lower animals, the rat seems most liable to be attacked. Rats thus suffering from, or dead of, the plague may infect other

animals which consume them, and, in addition, rats are always affected by a disease similar to the plague at the same time that man suffers. The period of incubation intervening between exposure to and the development of the affection is from three to six days. The onset is usually sudden and severe, the patient being seized with headache, fever, and prostration, and compelled straightway to seek his bed. In a few hours or a few days swollen gland develops, and the disease runs its course. On the 14th of June, 1894, Kitasato and Yersin, working at the time of the epidemic in Hong Kong, demonstrated the specific bacillus. It is described as a diplococcus, inclosed in a delicate capsule, and as a short bacillus with rounded ends with a clear space or band in the center.

An interesting fact, demonstrated by some figures drawn by Woodhead, was an apparent development of the bacillus after death, similarly to the development of the flagella of the plasmodium malarie some half an hour after removal from the body. There has been nothing definite determined respecting the influence of heat or cold, dryness or moisture, upon the development of the plague; but poverty, overcrowding, and bad sanitation are potent factors in its causation. The disease is commonly fatal in children, but not in nurslings, many of whom survive their mothers. In children the adenitis is usually about the cervical and nuchal region by extension from lesions in and about the mouth. In them there are cases with no recognizable buboes, especially in the later stage of an epidemic; it is rare in the earlier periods.

Treatment.—The most successful treatment is by the use of an antitoxic serum perfected by Yersin. This, if used early, will forestall the heart-failure so common, and the buboes soften and disappear without suppurating.

GLANDULAR FEVER.

A disorder called "glandular fever," occasionally epidemic, has been described by several writers, especially E. P. Feiffer in 1889, O. Huebner, and others since. These views had been criticized, but on the whole the testimony is fair that a special disease of distinct individuality exists, characterized by fever and swelling of the lymph-nodes. The disease is usually unilateral at first; later symmetric.

The lymph-nodes are hard and extremely tender. There is little or no edema of the adjoining tissues, nor does suppuration occur. Nephritis occasionally follows, from which prompt recovery is the rule. The cause is not known, but contagion is suspected, not proven. In diagnosis there must be excluded such causes as the commoner infections of mucous surfaces and sympathetic glandular irritations.

DIS

ARTHO

Arthritis is a disease of the joints, characterized by inflammation and swelling of the joint space. It is usually accompanied by pain and tenderness. The disease may be acute or chronic. In the acute form, the joint is swollen and painful, and the patient is unable to move it. In the chronic form, the joint is permanently swollen and the patient is unable to move it. The disease is usually caused by infection, but may also be caused by trauma or by a systemic disease.

Dermatitis, or

Dermatitis is a disease of the skin, characterized by inflammation and swelling of the skin. It is usually accompanied by redness, itching, and sometimes by the formation of blisters. The disease may be acute or chronic. In the acute form, the skin is red, swollen, and itchy. In the chronic form, the skin is permanently red and itchy. The disease is usually caused by infection, but may also be caused by trauma or by a systemic disease.

CHAPTER XVIII.

DISEASES OF THE SKIN.

APHTHOUS VULVITIS OF CHILDREN.

Aphthous vulvitis is a disorder peculiar to children, which may occur in the course of such systemic affections as roseola, and has appeared as an epidemic. It begins by the appearance of twelve or fifteen small vesicles, whitish or yellowish gray, confined to the neighborhood of the vulva. These may coalesce in a day or two into patches, and break down into shallow ulcers; the surrounding tissues are inflamed and swollen, accompanied by itching. If promptly treated, it soon gets well.

Aphthous vulvitis may occur simultaneously with aphthous stomatitis in the same individual, and may be confounded with variola, varicella, or localized diphtheria, and it especially resembles vulvar herpes.

The treatment consists of asepsis and the local use of some antiseptic or astringent powder, as iodoform, aristol, boric acid, or acetanilid, added to a dusting powder, as talc or starch.

DERMATITIS.

Dermatitis, or inflammation of the skin, may be due to the action of local influences, such as heat, cold, caustics, and other mechanical and chemic irritants which directly exert their effect on the skin, and those which act indirectly, acting from within or taken internally, due to the ingestion of certain drugs and also to toxins.

Dermatitis Traumatica.—Under this head are included all those forms of inflammation of the skin due to traumatism—viz., contusions, abrasions, or excoriations arising from direct violence to the skin; as, for example, especially in children, ill-fitting garments, shoes,

bandages, and other articles of wear. Excoriations from scratching, due to the presence of the various animal parasites, are important varieties. Other accidental lesions are so well known as not to need detailed description.

Treatment.—Remove the cause, and, if necessary, apply soothing lotions or ointments (see Acute Eczema).

Dermatitis Calorica.—Extremes of heat and cold both produce analogous inflammatory symptoms, the former as burns and the latter as frost-bites. Erythema solare, or sunburn, is a well-known example of what natural heat can produce. Although this may be erythematous, vesicular, or bullous, it never goes on to complete tissue destruction, as may happen from the ordinary burns or scalds. Cold or frost-bite may produce death of the affected parts from prolonged interference with peripheral circulation.

Treatment.—In burns of a mild degree, sol. ac. boric. sat. or lotio calaminæ (for formula see Erythema); apply frequently on lint and keep parts well moistened; or ac. boric., 5j; petrolat., 5j.

Frost-bite.—If seen immediately after exposure, gradually bring parts back to normal temperature with gentle friction by rubbing with snow or cold water. We have seen two cases in children who were told to plunge their feet while excessively cold in warm water, with the result of producing an angioneurotic edema.

Treatment.—After the parts are restored to their normal temperature stimulation is called for—applying a 12½ to 25 per cent. ung. ichthyol in petrolatum or strongly carbolyzed ointments. Use warm woolen stockings, avoid the girdle garter, and also avoid approaching a fire too quickly, which causes tingling and burning sensations.

Dermatitis Venenata.—This heading includes all inflammations caused by numerous external irritants which act deleteriously on the skin. The commonest causes are the well-known irritants,—mustard, turpentine, cantharides, mezecon, arnica,—anilin and corallin dyes (from undergarments and stockings), mercurial ointments, poisonous insects and fish—Portuguese men-of-war, etc. But the most common causes are the rhus plants—poison ivy (or poison oak) and poison sumach (or poison dogwood). The susceptibility to this poison in individuals varies to a great extent; some can handle the plants with impunity, while in other cases mere proximity is sufficient to cause cutaneous disturbance (toxicodendric acid, Maisch). The

lesions produced on the skin are erythema, wheals, papules, vesicles, pustules, or bullæ, with or without edema and swelling. The effect produced depends on the susceptibility of the individual, the virulence of the poison, and the length of exposure, or a combination of any or all. The symptoms of *rhus toxicodendron* (poison ivy or oak or poison sumac or dogwood) appear soon after exposure. As a rule, it acts quickly, a few hours often being sufficient to provoke an attack, in other cases several days being required. The vesicles vary in size from a pin-point to a split pea and are seated on inflamed and usually inflammatory bases. These vesicles are frequently angular (eczema vesicles are always round) and at times have an arrangement in streaks or lines. They may coalesce into blebs or become sero-purulent or pustular. Marked itching and burning are, as a rule, present. The hands, face, and forearms (in the male the genitalia also) are the favorite parts involved. The disease runs an acute course; the vesicles burst spontaneously or are broken, the contents drying into yellow crusts. The process may continue from one to six weeks and terminate in complete recovery; or, in those inclined to eczema, it may, however, result in a persistent form of that disease.

Treatment.—Remove the cause and apply soothing lotions and ointments, as in acute eczema. For *rhus toxicodendron* Duhring recommends ext. *grindelia robust.*, f $\frac{5}{j}$, ad f $\frac{5}{iv}$ to f $\frac{5}{vj}$ in water. We have used sat. sol. ac. boric with good effect; also lotio calaminæ and lotio nigra, followed by ung. zinci oxidi.

Dermatitis Medicamentosa.—As a rule, the ingestion of drugs, especially in children, does not produce an eruption, yet the number of drugs which may produce disturbances of the skin is considerable and may cause difficulties in diagnosis. It is usually due to an idiosyncrasy, to some defect in the elimination, or to a poisonous dose, or, perhaps, a combination of these conditions. Acetanilid or antifebrin produces a bluish tint of fingers and lips—a cyanosis.

Antipyrin causes an erythematous rash, morbilliform in character, and desquamation may follow. The eruption becomes confluent in patches. An important practical point here is, in a febrile case of a child, cause not known, not to give antipyrin as a febrifuge, as the drug may bring out an erythematous rash and mask the true nature of the disease. The rash of arsenic is erythematous or urticarial, or herpes zoster at times (J. Hutchinson). Atropina (belladonna) pro-

duces a diffuse erythematous blush, scarlatiniform, especially in children. The differential diagnosis is fortunately readily established by the dryness of throat, dilated pupils, and the absence of fever and of desquamation.

Bromids.—The great majority of eruptions met with in connection with this group of drugs are pustular. They are usually acneform, and occur in the favorite sites of acne—viz., the face, chest, back, and scalp. Sometimes they are furunculoid or bullous. In infants the eruption is liable to become confluent (Crocker). The lesions often continue to come out even after the use of the drug has been suspended.

Treatment.—Discontinue the drug and give arsenic internally. In cases of epilepsy, when bromids are necessary, the addition of arsenic will often prevent the acneform cutaneous lesions.

Chloral Hydrate.—Skin lesions resulting from chloral are mostly erythematous, dusky red papules or general scarlatiniform rash, followed by desquamation. "The oral and pharyngeal mucous membrane is also red, increasing the liability of its being mistaken for scarlatina, as a rise of two or three degrees of temperature is not uncommon" (Crocker).

Iodid eruptions are mostly pustular, acneform, appearing on the neck, shoulders, arms, and chest. They are also bullous at times, and may be erythematous, papular, hemorrhagic, or purpuric.

Opium eruptions are erythematous, scarlatiniform, often accompanied by pruritus, especially of the nose, but this may be general.

Quinin eruptions are usually erythematous and may be urticarial.

Turpentine eruptions are erythematous.

ECTHYMA.

Ecthyma is an inoculable and an auto-inoculable disease of the skin, characterized by the formation of one or more rounded pustules resting upon an inflamed base and having a tendency to spread eccentrically, with the formation of a brownish crust. It closely resembles pustular eczema, but in this country is differentiated from it clinically. It begins as a red point, on the second day appearing as a small papule or pustule in the center of an inflamed area; on the third day it becomes acuminate in the center; it then increases in size to the fifth or eighth day, when it becomes a large, flattened pustule; by the ninth

or eleventh day the central crust is formed, surrounded by a whitish circle, formed by the elevation of the epidermis by pus; thence it begins to heal, and by the fifteenth or twentieth day the lesion begins to disappear, leaving a more or less reddish-brown pigmented stain. Superficial cicatrices may result if the destructive ulceration has been deep enough. Ecthyma usually attacks the lower limbs, although appearing elsewhere. There is slight itching and burning. Furuncle differs from ecthyma by its more vivid red color and deeper infiltration. It may be transferred from one part to another by scratching, whereupon new lesions arise by inoculation, and it usually appears in debilitated people.

The **treatment** is systemic and tonic. Extra diet, pepsin, cod-liver oil, and iron in the form of Basham's mixture. Locally, antiseptics and parasitocides are necessary. The crust should be removed by a starch poultice containing boric acid, and the lesions washed with sublimate solution and dressed with an ointment of boric acid, 1 dram; calomel, 15 grs.; to the ounce of oxid of zinc ointment.

ECZEMA.

Eczema is the most common disease of the skin in this country, constituting from one-fourth to one-third of all cases. It is of almost infinite variety and distribution, and closely simulates a large number of other skin disorders. It is usually disfiguring and painful through the intensity of the itching and burning which accompanies its progress. Eczema is an inflammatory, acute, or chronic disease of the skin, characterized at its commencement by erythema, papules, vesicles, or pustules, or a combination of these lesions, accompanied by more or less infiltration and itching, ending either in discharge with a formation of crusts or in desquamation. It is also described as a catarrh of the skin, affecting as it does the mucous layer. As encountered in children it has much the same features as in adults, but occupies certain situations more frequently in a child, as the scalp and face. Also it is of a more acute, inflammatory type, and there is greater evidence of glandular enlargement, abscesses, and boils, especially in ill-nourished children or those of depraved vitality. The glands rarely suppurate. In former times all these were regarded as forms of sympathetic adenitis; it is, however, not an evidence of

constitutional disease, but merely a sufficient irritation for which pediculosis is an ample cause. Eczema in children may be acute, arising *de novo* from various causes, both general and local, and is then quite manageable. It is much more commonly met with as a subacute disorder following in the wake of a host of causes, the diverse forms of dermatitis and various specific diseases of the skin and the exanthemata. Eczema may occur as a localized patch upon the cheeks or scalp or under the chin or generalized, scattered over the body and limbs in infiltrated patches of various sizes, appearing scaly or in aggregations of papules, or in weeping and raw surfaces.

It may, at times, be inveterately chronic, defying the wisdom of the elect, and obdurately resisting every effort at relief, until the patience of the medical adviser is exhausted along with his wisdom, and to shield himself he may claim that to cure it at this stage would be "to drive it in and imperil life." Again, a critical epoch, such as the eruption of certain teeth, the period of puberty, a change in the weather, the rotation of the seasons, or, what is often very efficacious, a complete alteration in the environment and feeding brings relief.

The form of the eruption may be the typical one of erythema, papules, vesicles, or pustules; all of which may not be present at the same time, one form merging into another, but usually one will predominate. Any one of these may develop into eczema rubrum, which exhibits a red, raw, weeping surface due to the exposure of the rete mucosa, a shedding of the upper epithelial layers. Squamous or scaly eczema may also follow upon any of these primary forms, appearing in patches of red, scaly, and thickened skin. Finally, by reason of the duration of the disorder or its position upon tougher or tenderer parts of the skin, there may arise a bark-like hardness or horny or cracked or fissured conditions. The most important symptom, far and away, is the itching; this is the real disease and passes the descriptive capacity of most sufferers, and likewise overwhelms their endurance. Eczema bears a close similitude to catarrhs of the mucous membrane both in its habit of discharge and tendency to relapse. To be sure, it often happens that the exudate is scanty, and eczema may remain a dry disease throughout its course, but is capable of being made at any moment a wet one by sufficient irritation and scratching.

Cause.—Eczema is the most frequently occurring skin disease

in childhood. It is a catarrhal inflammation of the skin, to which the delicate tissues of childhood are especially liable, and from exciting causes the most numerous. There is a predisposition in some children to skin troubles, or rather to a vulnerability of the skin, probably because it is not well developed, or because the individual has feeble resistance. In badly nourished children of lowered vitality from defective hygiene and constitutional inheritance, eczema is most likely to arise, especially the pustular form, and it is frequently accompanied by swollen glands, ciliary blepharitis, and running ears. Vaccination is a common cause or, rather, an irritative starting-point in a susceptible child; so is measles, where it often attacks the edges of the eyelids. The dietetic errors competent to initiate eczema are of large variety; too much food, especially of a coarse or improper form, is quite as bad as too little. A food overrich in proteids seems to be hurtful, and certainly helps to produce one of the causes, which is overacidity of the blood; also such foods as readily induce gastric acidity, such as oatmeal undercooked, with sugar and cream, is recognized as a direct cause. Dentition is blamed unduly for inducing eczema, but it is merely one source of irritation; there are many exciting causes: cold and damp weather, depressing heat, bad soaps, hard bathing water, and rough underclothes. There is a large variety of organisms capable of producing eczema, especially where the secretions have undergone decomposition.

Treatment.—To be accomplished in the treatment of eczema is a possession in itself. So rarely does the average practitioner attain this distinction that it is well worth choosing as a special subject of study. This can not be acquired, or only through infinite labor and pain, unless the student has an opportunity of which he shall avail himself adequately, to work in a skin dispensary for a considerable time under the tutelage of a master of the art; such has been our privilege, and so large and difficult is the subject, and so many failures have followed our efforts, that the wonder is how any one could get along without a similar experience. We have had very good success in treating eczemas in babies and children upon this general outline: First, to regulate the diet, which in most instances requires thorough revision; next, to use some laxative and alkaline medicine which shall relieve both the bowel of offending matters and expedite the flow of urine and lessen its hyperacidity; then comes the enforcement of rather

more rest and sleep than the child has been accustomed to get; the relief from excitements of all kind as much as possible. The room in which the baby is kept should be a southern one, defending it against heat in summer, as much as possible, and cold in winter, and dampness at all times. A common room or living room, wherein cooking and washing takes place, often simultaneously, alternating with clouds of steam and burnt-up air from red-hot stoves and ranges, is most pernicious to tender skins and mucous membranes, producing catarrhs of the respiratory passages, eyes, and mouth, and also producing catarrhal conditions of the skin of which eczema is the chief. Such a room is also in a perpetual cycle of overheating or overcooling. In children of the well-to-do classes this danger is, of course, escaped, and among them eczema is not so prevalent. They also escape another danger of the more ambitious of the poorer folk, who are overzealous in their use of soap and water. The final important hygienic consideration, then, in this little sketch, is care in the pursuit of personal cleanliness, in which, among babies, not so much soap should be employed and a better article selected. It is not a question of cheapness, for good Castile soap costs no more than the ever-handly laundry soap which is found so efficacious upon pots and pans, and is made to do efficient duty on the very dirty child. Again, whatever soap is used, be it good or bad, it should be completely washed away after having been applied, which in infants and children should always be sparingly. A good practical rule is to insist in the final use during the process of ablution of another cloth and cooler water, which will make sure of a final riddance of all soap. Moreover, the water used needs care, and it is well that it should be boiled before using.

So much for prevention as well as cure. When an eczema is present, or a dermatitis from which it may come, the first rule is to insist that no soap whatever shall be used, and only luke-warm boiled water (better still, saturated solution of boric acid) sparingly for cleansing purposes. To this may be added with great advantage a solution of bran, made by taking a handful of bran, wrapped up in a loose meshed cloth, dipped in hot or boiling water, and then stirred about and finally squeezed into the bath water. To this it is sometimes well to add, per basinful, a teaspoonful of bicarbonate of soda, or of washing ammonia, and if there be much itching, fifteen to twenty drops of carbolic acid or essence of mint, one or all. The carbolic acid has a

certain danger unless cautiously used and in limited areas. Lastly, as a protective as well as a cleanser, sweet oil; by this is meant olive oil, when procurable, not cotton-seed oil, to each ounce of which add three to five grains of acid. carbol.

For large areas in babies a boric-acid ointment—

Acid. boric.,	3j
Petrolat.,	℥j.

—is safer and better. This, applied after a water-bath, defends the skin from irritation of clothing or moisture or whatever cause, and if the eczema be quite annoying, used upon a soft doppel of cotton, will serve admirably in lieu of the water-bath. Under this treatment most eczemas of infants will get well. In addition to this may be used powders, antiseptic and soothing; powders should always be both, or sometimes an ointment is needed, first soothing and later stimulating. It will be noted—and observant mothers will volunteer this information—that eczema of the exposed parts, as the face or head, are obviously worse in damp, stormy weather, or when melting snow is about, and grow conspicuously better as soon as a dry air prevails. Children with susceptible skins will need to be protected by veils when abroad, and, indeed, should not be allowed to go out in very bad weather. The ideal condition for an eczematous child is a large room opening to the south, with abundant window light, heated in such a way as not to unduly parch the air, and in which a number of healthy, growing plants are placed. The plants aid materially in regulating the atmospheric moisture in the most beneficent way. Such a room needs very little artificial heat, especially in sunny weather; the children can be dressed as if for out of doors. Indeed, it is always better for children able to play about alone to have a thoroughly ventilated room, like the one described, and to use extra clothing for warmth rather than artificial heat. The disease in young infants is usually acute; first, erythematous eczema, then papular, rapidly running into vesicular, then, as affected by scratching and rubbing, there results the pustular and red weeping eczema; accompanying is a certain degree of infiltration, and along with this a severe and painful itching, and the disease is extended by the aggravation induced by scratching and rubbing. It is a matter of amazement what an enormous strain infants can endure by weeks and months of this. In adults it would

induce a prostration of the nervous forces most disastrous. But, as has been said by Dr. White, of Boston, it not seldom happens that a whole household is exhausted in its endeavors to relieve the sufferings of an infant, who not only retains its vigor and plumpness, but in the end is the only healthy member of the outfit. An ancient fallacy prevails still in remote places, and be it asserted with caution, too, in high places in our midst, that it is in some sense perilous to apply local remedies, which may endanger the patient's life by driving the disease inward. This is a rag of the ancient humoristic theory, used as a skeptic cloak to cover ignorance.

Van Harlingen lays down "two general principles which obtain in regard to the local treatment of eczema: these are, first, that in the acute form the treatment can scarcely be too soothing; secondly, that in the chronic form the treatment can hardly be too stimulating. So long as there is eczema and hyperemia there will be itching; so long as there is itching there will be scratching: so long as there is scratching there will be no chance for the excoriated skin to heal." The infant or young child can not be wrapped up in a cloth, swaddled in fact, in lotions or ointments, but these must be applied in such a way as to permit freedom of movement; therefore one of the most valuable devices is the close-fitting garment devised by Dr. White, made of linen or lint, on which these may be applied, and forms a protective coating to the inflamed skin. This consists of a mask, fitting the head and face, with apertures for the eyes, nose, and mouth, and slits for the ears. It is, perhaps, best adjusted by safety-pins, and worn for twenty-four hours, or changed at shorter or longer intervals. It is well, also, where the trunk and limbs are affected, to use a sort of straight-jacket in addition to the mask, and it is well that it should cover the hands and feet also; the covering of the hands defends the skin from scratching. This will immensely shorten the course of the disease. Local remedies must be selected with strict attention to the character of the lesions in each individual case. Acute eruptions should usually be treated with soothing remedies. In vesicular eruptions soap and water should be avoided, but the crusts let alone if no decomposition is going on beneath. If pus is formed, the resulting crust and debris had best be removed before decomposition with its consequent irritation sets in. If itching be severe and aggravated by the rapid formation of vesicles, these should be allowed vent; where there is

extensive infiltration along with itching, stimulating measures are required. To soften down the crusts, a starch poultice is of value, to which should be added ten parts of boric acid to the 1000. This gives great relief, and should be changed every three to six hours. In less severe cases muslin, dipped in bran or starch water and covered with waxed paper, will do very well.

ACUTE ECZEMA.

In the choice of a remedy to relieve acute eczema it is better to begin by making the application over a limited area until its effect is learned. In this way several remedies can be used if the affected areas be extensive, and that which produces the best effect can then be chosen. Cautious experimentation is essential to success. A powder mostly of starch is best suited for large surfaces, to which may be added lycopodium, bismuth, talc, dermatol, or other suitable powder, in experimental patches. Moist applications are oftentimes soothing and represent a continued bath. The starch poultice is one of the most reliable of the moist applications, adding five to ten parts of boric acid to the 1000, as described above. Potato starch is preferred. It may be made by placing the starch in a flat bag, dipping in boiling water and cooling; or ordinary washing starch rubbed into a smooth paste with cold water and spread upon linen and fastened with bandages. This remedy gives great relief if used carefully and changed every three to six hours. For the ordinary run of cases a decoction of bran or starch water applied on soft muslin and covered with thin impermeable cloths will suffice. If the same cloths are reapplied, they must be disinfected each time and creases and folds avoided. If the patient be chilly from these wet dressings, a layer of cotton-wool or flannel may be placed over them. A good routine plan for acute eczema is to begin by bathing the part with diluted black wash or the following modification of it:

R. Calomel, ʒ ss
Mucilago tragacanthæ, ʒ j
Liquor calcis, f ʒ xj.

Applied on cloths laid on the skin for a few minutes.

Then, with the finger, gently rubbing into the surface before it becomes dry, the following ointment :

R. Pulv. zinci oxidi,
Ung. aquæ rosæ,
Vaselini, aa ̄iv.

Or Lassar's paste :

R. Acid. salicyl., gr. x
Pulv. zinci oxidi,
Pulv. amyli, aa ̄ij
Petrolat. (or vaselini), ̄ss.

Apply three times daily after first cleansing the surface with cosmolin.

Other washes recommended are these :

R. Liq. plumbi subacetat. dil., O ss
Glycerin, ̄ss.

Also :

R. Ext. grindelia robusta, f̄ss-j
Aquæ dest., Oj.

These last may be applied on cloths and remain until dry.

For the relief of itching cloths wrung out of hot water, laid on in succession, are of use. Carbolic acid, the most efficient antipruritic, must be used with extreme caution in the acute stages. It may be added to the black wash along with a little glycerin, and is always useful but only free from some danger of absorption and poisoning if the skin is unbroken. Ointments in certain cases suit better than lotions. Cold cream is a better base for ointments in children than lard or vaselin. Oleate of zinc is a useful addition to some ointments.

R. Zinci oleat.,
Ung. aquæ rosæ,
Olei amygdalæ, aa ̄ss.

The oleate of bismuth is also recommended ; also the saturated solution of boric acid, or :

R. Resorcin, gr. x
Glycerin, m̄x
Bis. subnit., ̄ss
Liq. calcis, f̄ssj.

For oozing and itching areas :

R. Bismuth oxidi,	ʒj
Acidi oleici,	ʒj
Cera alba,	ʒiij
Vaselini,	ʒix
Ol. rosæ,	℥ij.

Rub the oxid of bismuth with the oleic acid and let it stand for two hours, then place in a water-bath until the bismuth oxid is dissolved. Add the vaselin and wax, and stir until cold. Among other soothing dressings may be mentioned cucumber ointment, glycerol of starch, a pure almond and olive oil, and diluted glycerin, one part to four or six of boiled or distilled water.

CHRONIC ECZEMA.

“Acute” and “chronic,” used in describing states of eczema, are misleading; we may have an acute attack on top of an old chronic case induced by digestive or other constitutional disturbances. This must then be treated as an acute eczema by soothing measures only until this feature of the condition is under full control.

In most cases of subacute or protracted eczemas, the soothing treatment used in the acute form is alone suitable. It will occasionally be necessary, however, to make use of more stimulating remedies. Carbolic acid or resorcin are then the most valuable remedies. Preparations of tar are to be used with caution as they may cause inflammation, and are more suited to the inveterate chronic condition where there is more or less infiltration. The portion of tar should rarely be more than from ten to forty grains to the ounce. The form may be the *pix liquida* or the *oleum cadini*, the effects of which are practically identical.

For eczema of the scalp a semifluid form is convenient.

R. Picis liquidæ,	ʒj
Glycerinæ,	ʒj
Alcoholis,	ʒvj
Ol. amygdalæ amaræ,	℥xv.

Preparations of tar must be thoroughly rubbed into the skin by a mop or the fingers of an attendant. Soaps play an important part in the treatment of some forms of eczema. Ordinary washing soaps had best be used as little as possible. Strong alkaline soaps are used to

stimulate stubborn patches, or to remove infiltrations. A useful preparation for cleansing areas when covered with accumulated crusts and scales is :

R. Saponis viridis, $\bar{3}$ ij
 Alcoholis, $\bar{3}$ j-ij.
 Dissolving with heat and filter.

This is a powerful stimulant and cleanser, rubbed in with a mop, taking great care to wash it all thoroughly out again with hot water, the surface then dried with soft cloths, and a soothing ointment applied.

Other remedies for chronic eczema are mercurial preparations, useful only in limited areas and always with extreme caution.

R. Hydrarg. chloridi miti, gr. v-xx
 Ung. zinci oxidi,
 Petrolat., aa . . . $\bar{3}$ ss.

The red oxid of mercury, two to thirty grains to the ounce, is useful ; a mild mercurial ointment is the ammoniated mercury, ten to twenty grains to the ounce, suitable in the pustular eczemas of children.

Sulphur and resorcin are valuable in some forms, particularly in eczema seborrhoeicum, in ointments of ten to twenty grains to the ounce of cold cream. Lassar's paste is useful here as well as in the acute forms (see formula, page 660).

The treatment of eczema must include internal medication of such a kind as shall correct obvious disturbances. These are usually digestive, and the remedies are outlined elsewhere. It is usually important to make occasional use of laxatives as well, sometimes in quite a long course, especially in older children. Diathetic conditions, such as uricacidemia, is frequently a factor, or vasomotor disturbances of central origin, requiring both internal and external measures for its relief. Nutritional tonics are usually needed, even though the subject exhibit no obvious deficiency.

Differential diagnosis may be made between eczema and other disorders which often resemble it by comparing the following tables (from Van Harlingen) :

ECZEMA (ERYTHEMATOSUM).

1. Not contagious ; frequently history of eczema elsewhere.
2. Accompanied by mild symptoms.

ERYSIPELAS.

1. Frequent history of contagion.
2. Well-marked constitutional symptoms.

3. Little or no edema, but some infiltration, shown by the thickness of the skin on pinching up a roll between the fingers. Surface dull red and often slightly scaly.

4. Not a creeping disease, though it may spread irregularly.

5. Inflammation less acute and more superficial.

6. Itching perhaps more marked than burning.

7. Not apt to be painful on pressure.

8. Not infrequently some secretion at one stage or another.

9. Vesicles form early if at all.

10. Runs a chronic course.

11. No line of demarcation.

12. No rise of temperature.

ECZEMA (PAPULOSUM).

1. History of eczema.

2. Eruptions may appear more gradually.

3. Often extensive.

4. Lasts usually for weeks.

5. Absence of blood-crusts, excepting in connection with the papular lesions.

6. Usually accompanied by other forms of eczema.

7. Itching severe. Not so much burning as pricking. Not so markedly aggravated by currents of air, etc.

8. Eruption remains the same for days.

9. Skin not especially irritable.

ECZEMA (VESICULOSUM.)

1. Begins with a slight burning or itching.

2. Vesicles seldom form distinct groups.

3. Shining redness; the skin tense; marked edema.

4. A creeping eruption, spreading peripherally.

5. Inflammation very acute and deep-seated.

6. Intense burning and little pruritus.

7. Usually very painful on pressure.

8. No discharge except from ruptured blebs.

9. Vesicles, or rather blebs, form late.

10. Runs a rapid course.

11. A distinct line of demarcation.

12. Always a rise of temperature.

URTICARIA.

1. Often history of error in diet, or dyspepsia.

2. Eruptions appear suddenly.

3. Usually not extensive.

4. The separate attacks may last but a few hours.

5. Frequent presence of blood-crusts from scratching as the only evidence of the disease.

6. Not accompanied by other forms of eruption elsewhere.

7. Itching, tingling, pricking, and burning intense. Usually aggravated by currents of cold air, undressing, etc. Often intense nervousness.

8. Exacerbations may occur in a few hours.

9. Welts form immediately on irritation of the skin.

HERPES ZOSTER.

1. Neuralgic pains a premonitory symptom.

2. Vesicles are arranged in distinct groups.

ECZEMA (VESICULOSUM).—*Continued.*

3. Vesicles tend to run together.
4. Vesicles small.
5. Vesicles tend to rupture.
6. Formation of crusts.
7. Eruption accompanied by more or less intense itching.
8. No special arrangement of lesions.
9. Eruption occurs on both sides.

ECZEMA (SQUAMOSUM).

1. Presence of moisture at some time.
2. Skin red and thickened.
3. Scales more firmly adherent.
4. Ears frequently attacked.
5. Alopecia less frequent, and the hair usually returns after the eczema is cured.
6. Hairs frequently matted together.

ECZEMA (SQUAMOSUM).

1. Eruption fades gradually into surrounding skin.
2. Scales thin and scanty.
3. Presence of moisture at some stage.
4. Lesions change in character from time to time.
5. Scales small and yellowish.
6. Intense itching.
7. Patches of eruption large and irregular.
8. No seat of predilection.
9. No uniformity of lesions.
10. Considerable induration of patches.
11. Ears and face frequently attacked in eczema of the scalp.

HERPES ZOSTER.—*Continued.*

3. Vesicles markedly distinct and independent.
4. Vesicles large.
5. Vesicles do not rupture spontaneously.
6. No crusts unless vesicles are accidentally ruptured.
7. Burning pain, often lancinating, accompanies the eruption.
8. Eruptions follow the course of some nerve.
9. Eruption limited to one-half of the body.

PITYRIASIS (CAPITIS).

1. Always a dry disease.
2. Skin not thickened nor inflamed.
3. Scales easily detached.
4. Disease limited to scalp.
5. Frequently more or less baldness ensues after a time.
6. Hairs surrounded by a scaly sheath.

PSORIASIS.

1. Patches of eruption sharply defined.
2. Scales thick and abundant.
3. Eruption always dry.
4. Eruption remains the same from week to week.
5. Scales large and pearl-like.
6. Itching less severe.
7. Patches of eruption smaller and round.
8. Seat of predilection on knees, elbows, etc.
9. Great uniformity of lesions.
10. Less induration but greater vascularity.
11. When affecting scalp, usually limited to hairy parts, just extending to the edge and limited by an abrupt line of demarcation.

ECZEMA (PAPULOSUM).

1. No desquamation.
2. Lesions remain papular for weeks.
3. Severe itching.
4. Papules rounded and more or less acuminate.
5. Papules rounded in outline.
6. Color of lesions bright red.
7. Lesions irregularly arranged.
8. Little or no subsequent pigmentation.
9. Papules often unite, losing their identity.
10. Health remains good in most cases.

ECZEMA (SQUAMOSUM).

1. Redness occurs in patches.
2. Intense itching and some burning.
3. Scales small and bran-like.
4. Scales form slowly.
5. Skin infiltrated and thickened.
6. Exudation present at some period.
7. Scales not very abundant.
8. Affection common.
9. General health remains good.

ECZEMA (SQUAMOSUM).

1. Eruption usually irregular.
2. Margins ill-defined.
3. Scaling bran-like and abundant.
4. Not contagious.
5. Irregular character of eruption.
6. Does not heal from center.
7. Usually a chronic affection.
8. Non-parasitic disease.

LICHEN RUBER PLANUS.

1. Desquamation.
2. Remain papular for months.
3. Usually slight itching.
4. Papules flat and slightly depressed and some umbilication in the center.
5. Papules have a peculiar squarish or angular outline.
6. Color of lesions dull red or violaceous.
7. Lesions seem sometimes to follow nerve-trunks.
8. Lesions have some pigmentation or straining.
9. Papules retain their individuality, although forming patches.
10. Health often impaired.

PITYRIASIS RUBRA.

1. Uniform redness.
2. Slight itching and no burning.
3. Scales large and papery.
4. Scales reproduced rapidly.
5. Skin not infiltrated.
6. Process always a dry one.
7. Scales very numerous.
8. Rare disease.
9. Severe constitutional disturbance after disease has lasted some time.

TINEA CIRCINATA.

1. Eruption circular in form.
2. Margin well-defined and raised.
3. Slight, shreddy desquamation.
4. Communicable.
5. Eruption ring-shaped.
6. Tendency to heal from center.
7. Disease runs an acute course.
8. Presence of mycelium under the microscope.

ECZEMA (PUSTULOSUM).

1. Non-parasitic disease.
2. Not communicable.
3. No peculiar odor.
4. Exudation purulent.
5. No permanent loss of hair.
6. Hairs appear normal.
7. Eruption never ends in ulceration or cicatrization.
8. Crusts moist and sticky.
9. Acute course of disease.

ECZEMA (PAPULO-PUSTULOSUM).

1. Non-parasitic disease.
2. No burrows.
3. Not communicable.
4. Vesicles and pustules confluent.
5. Eruption sudden and not progressive.
6. Vesicles clear.
7. Pruritus less severe.
8. No special seat of election.
9. Scalp may be affected.
10. Individual lesions usually small.
11. Vesicles usually rupture.

FAVUS.

1. Peculiar vegetable parasite to be found in abundance under microscope.
2. Contagious.
3. Lesions have a characteristic mouse-like odor.
4. Exudation dry and powdery, canary-yellow lesions cup-shaped, hair protrudes through center of cup.
5. Eruption gives rise to scars and alopecia.
6. Hairs brittle, dry, and wiry.
7. Disease may result in cicatrization.
8. Crusts dry and friable.
9. Very chronic affection.

SCABIES.

1. Presence of parasites.
2. Presence of burrows. Pathognomonic.
3. Very contagious.
4. Vesicles, papules, and pustules discrete.
5. Eruption progressive.
6. Irregular dots on vesicles.
7. Itching intense, especially at night.
8. Lesions found especially between fingers; on flexor surface of the wrists; on anterior folds of axilla; about nipples; on shaft or head of penis, buttocks popliteal spaces.
9. Disease very rarely affects scalp (This does not apply to infants.)*
10. Vesicles and pustules often very large.
11. Vesicles do not rupture spontaneously.

* In infants whose scalps and faces are warm and moist, from nursing in arms and lying in cribs, the mite will flourish bravely.

ECZEMA (ERYTHEMATOSUM).

1. History frequently of eczema.
2. Eruption limited in extent.
3. Patches of eruption quite large.
4. Intense itching.
5. Lesions bright red color.
6. Usually accompanied by other forms of eczema.
7. Slight scaling, but no pigmentation.
8. Skin thickening.

ECZEMA (PAPULOSUM).

1. History of eczema.
2. Eruption usually limited in area.
3. Superficial eruption.
4. Eruption usually moist at one time or other.
5. Severe itching.
6. Lesions less distinct.
7. Vesicles not infrequently associated with papules.
8. Lesions more acute and active.
9. Lesions tend to group and unite.

ECZEMA (SQUAMOSUM).

1. History of eczema.
2. Eruption superficial.
3. Intense itching.
4. Eruption moist at one time or another.
5. Eruption red in color.
6. Scales abundant and thick.
7. Infiltrations less marked and inflamed.
8. Margins indistinct and not abruptly elevated.
9. Heals first at edges.
10. Lesions active and inflammatory.
11. No secondary lesions except large, painful glands in neighborhood of eruption.
12. Eruption has an irregular outline.

SYPHILODERMA (ERYTHEM.).

1. History of chancre.
2. Eruption diffuse.
3. Individual lesions small.
4. Rarely much itching, if any.
5. Coppery fawn or pale-rose color.
6. Presence of other syphilitic symptoms.
7. No scaling, but pigmentation.
8. No induration of the skin.

SYPHILODERMA (PAPULOSUM).

1. History of syphilis.
2. Eruption extensive.
3. Eruption deep-seated.
4. Eruption dry from the first.
5. Little or no itching.
6. Lesions have a firm, shotty feel.
7. Distinctly papular.
8. Lesions chronic and passive.
9. Lesions usually discrete.

SYPHILODERMA (SQUAMOSUM).

1. History of syphilis.
2. Eruption deep-seated.
3. Slight itching.
4. No discharge.
5. Eruption ham-colored.
6. Scales scanty and thin.
7. Infiltration of skin marked and cellular.
8. Margins elevated and well defined.
9. Tendency to heal at center.
10. Lesions passive and but slightly inflamed.
11. Presence of secondary lesions.
12. Tendency to occur with circular outline.

ECZEMA (PUSTULOSUM).

1. History of eczema.
2. Often itching.
3. No bad odor.
4. No ulceration.
5. No scarring.
6. Eruption usually confluent in large patches.
7. Scales less prominent and never stratified.
8. Vesicles present at some stage.
9. Eruption develops rapidly and disappears sooner.
10. Crusts moist.
11. Scales less adherent.
12. Absence of secondary lesions.

SYPHILODERMA (PUSTULOSUM).

1. History of syphilis.
2. Itching absent or moderate.
3. Odor very disagreeable.
4. Ulceration under crusts.
5. Lesions leave scars.
6. Lesions discrete or form small, irregular patches with circular outline.
7. Scales prominent and often in the form of rupia (oyster-shell like).
8. Pustules usually occur alone.
9. Lesions develop slowly and last long.
10. Crusts dry.
11. Scales adherent.
12. Presence of secondary lesions.

ERYTHEMA.

Six varieties of erythema are worthy of mention : Erythema simplex, erythema intertrigo, erythema vaccinum, erythema variolosum, erythema multiforme, and erythema nodosum.

The first four are simply hyperemias with little or no inflammatory exudation, while the last two are characterized by more or less plastic exudation. They all terminate without leaving a mark or scar. Erythema simplex is characterized by redness occurring in patches, from whatsoever cause, in form of variously sized, diffused, or circumscribed areas. Varieties: (a) Irritations caused by heat or cold, pressure or rubbing, irritating or poisonous substances; (b) symptomatic, due to some systemic disturbance, as disorders of the digestion or the blood. The treatment is the removal of the obvious cause, local or internal. Locally, soothing or astringent lotions. Bran decoction with soda, with, it may be, a few drops of carbolic acid. The calamin lotion has a wide range of usefulness :

R. Pulv. calamin, ʒ iij
 Pulv. zinci oxidi, ʒ ij
 Glycerinæ, ℥xl
 Liq. calcis,
 Aq. rosæ, aa . . . f ʒ ij.

Ointments are apt to disagree.

Erythema Intertrigo.—A common form of irritation occurring on the natural folds of the skin where these come in contact with each other and chafe, as about the buttocks, groin, and armpit. The skin feels hot and sore; perspiration macerates the epidermis and may cause an acrid, mucoid discharge; the cause is usually mechanical by the rubbing together of two surfaces of skin or the contact of rough clothing, or acid urine, or salt sea-water, or sweat.

The treatment is cleanliness and care to keep the parts asunder. Smooth bits of linen or wads of absorbent cotton placed in between are comforting and preventive.

R. Pulv. acid. boric., ʒj
Pulv. talc., ʒj.

is a powder which will not ferment. Calamin lotion is also useful.

Certain other powders are useful: Oxid of zinc, stearate of zinc, bismuth, magnesia, fullers' earth, and talc. In stubborn cases, black wash diluted with lime-water, dilute alcohol, with alum or sulphate of zinc (weak solution: Zinci sulph., gr. ss to gr. ij; aquæ, fʒj), followed by a powder. If hyperidrosis occur about the genitalia, etc., belladonna may be added to the lotions. If the digestion of a child be disturbed, alkaline laxatives and diuretics may be given, to which a bromid may be advantageously added.

Erythema infantile ("Roseola"), common in infants suffering from gastric disturbance or febrile complaints, occurs chiefly on the trunk, and may be mistaken for scarlet fever or measles.

Erythema vaccinum ("Roseola vaccinia") occurs frequently a day or two after vaccination, extending over the trunk and extremities, and sometimes induces the fear of syphilitic infection. This last has a much longer incubation period, and is of a dusky red, and not the usual fawn color of the syphiloderm.

Erythema variolosum, one of the prodromal rashes of small-pox, appears in a characteristic locality over the abdomen and inner side of the thighs, the dorsal surfaces of hands and feet, and the axilla. It may be accompanied by redness of the pharynx. In a few days the diagnosis will be made clear.

Erythema multiforme is very like erythema simplex, but more severe; it manifests itself as erythematous patches of most varied shapes and sizes, or as papules, vesicopapules, and tubercles, scattered or in

groups. The papular type is the most common. With or without symptoms of malaise or rheumatic pains, the lesions appear suddenly. These soon fade and seldom last longer than a week or ten days; though very severe looking, the lesions disappear spontaneously, leaving perhaps slight pigmentation or desquamation. They occur symmetrically, are usually seen on the backs of the hands, feet, and knuckles, but may be more or less general, appearing in the spring and fall. As a rule, no subjective symptoms are complained of.

Erythema iris is erythema multiforme when we have a play of colors in the lesions. One or more rings concentrically arranged may appear, giving the lesion a target-like appearance.

Herpes iris is simply erythema iris. Here sufficient serous exudation has taken place to raise the epidermis from the tissues beneath in the form of vesicles or bullæ.

The treatment of erythema multiforme is very simple,—quinin, salicylates, mild, saline laxatives and diuretics, a carbolic acid wash, one to three drams to the pint of camphor water, adding a little glycerin and perhaps soda; dusting powders may be used.

Erythema nodosum is an inflammatory disease characterized by rounded or oval, more or less elevated reddish nodes. It is ushered in by some systemic disturbance and rheumatoid pains with swellings around the joints. The nodes appear suddenly on any part of the body, but commonly on the legs and arms, especially over tibia, long axis of node, parallel to axis of tibia usually. They vary in size from a small nut to an egg, are reddish at first, tending to become purple or blue, and as they disappear turn yellow, simulating bruises. When the nodes are at their height they look as though they contained fluid, and may be hemorrhagic. They never suppurate. The disease occurs most frequently in children and young adults. The lesions come out in crops from a few to a dozen or more, usually attended by a sensation of heat and are tender upon pressure. The duration is from one to four weeks. The treatment is merely constitutional and tonic. Salicylates are called for and, locally, soothing applications—lead-water and laudanum, hot fomentations.

FURUNCLE.

Synonym.—BOIL.

Furuncle, commonly known as boil, is a deep-seated inflammatory disease, characterized by one or more variously sized, circumscribed, large or small acuminate, firm, painful formations, usually terminating in a central suppuration. Boils may occur singly, in groups, or often in successive crops. The lesion begins as a small, ill-defined red spot in the true skin, tender and painful from the first, becoming larger, elevated, and showing a tendency to suppurate about the center. It matures in about a week or ten days, in a slightly raised or pointed formation, with a suppurating center called the core. This core may not form, and it is then called a "blind" boil. It usually produces a dull, throbbing pain, increasing until suppuration takes place, and then subsides. Sometimes there is sympathetic constitutional disturbance; neighboring glands may be enlarged. Boils not seldom occur in the course of other diseases, and occasionally at certain seasons, as in the spring and autumn, appearing as an epidemic. Boils differ from anthrax or carbuncle in having but one point of suppuration; the carbuncle has many, is flat, varies in size from half an inch to four inches in diameter, and while painful is not tender as furuncle is.

Frequently in children there occurs the condition known as "furunculosis," or crops of usually small pea- to bean- or larger-sized phlegmonous papules or papulopustules. These run their course, fresh crops appear, and thus the process continues. These boils do not form any definite group; they are usually scattered over one or several portions of the body, are usually isolated, and occur on the trunk, limbs, forehead, and scalp. They are connected with hyperidrosis. We have seen them in infants follow an attack of miliaria papulosa (prickly heat), and exist in considerable numbers.

Treatment.—The object is to destroy the cocci in each boil and thereby exhaust the supply. Open the pustules surgically and gently express the pus (rough handling of a small boil may readily convert it into a big one), after which apply three or four times daily the following, which we have used with marked benefit and can highly recommend:

R.	Ichthyol,	℥xx	
	Acid. boric.,	gr. xv.	
	Aq. destil.,	f ʒj.	M.

Sig.—Apply to surface, using an atomizer.

Used thus, the application causes no pain to the infant or resistance of the little sufferer, and new crops will not appear, as the soil is made unfavorable to the growth of the staphylococci.

The disease is regarded as due to the micrococci, especially the staphylococcus aureus, invading the sweat glands or hair follicles. The soil also must be favorable for their development.

Since the staphylococcus pyogenes aureus has been demonstrated to be the cause of boils, parasitocides have come into use.

The following plaster spread on and kept in place is claimed to be of use :

R. Acid. salicylic., ʒij
Emplast. saponat., ʒij
Emplast. diachyli, ʒj.

SIG.—Spread on cloth or kid, a crossed slit to be cut in this over the apex of the boil.

Ichthyol ointment, 12½ to 25 per cent., in lanolin and petrolat., rubbed in persistently for ten minutes, is one of the best means of aborting the local inflammation. When pus has once been formed free incision should be made. Bulkely praises a mixture of—

R. Acid. carbolic., grs. x
Ext. fl. ergot., ʒj-ʒij
Ung. zinci oxid., ʒij-ʒiv.

Peroxid of hydrogen is then useful, not only as a cleanser but as an antiseptic. This had best be applied in full strength upon absorbent cotton, at the end of a probe or stick or wire applicator. If poultices are used—and they are often a great comfort—they should contain boric acid and possibly laudanum.

HERPES ZOSTER.

Synonyms.—ZONA; SHINGLES.

Zona, or shingles, is an acute inflammatory disease, characterized by groups of vesicles seated upon inflamed bases, following the distribution of cutaneous nerves and accompanied by more or less neuralgic pain. The lesions vary in size from a pinhead to that of a split pea, and they may coalesce, but the patches do not show this tendency. The eruption is almost always unilateral and occurs over an easily-traced nerve-trunk. New vesicles continue to appear until the fourth or eighth day, remaining thus a few days, then gradually dry up, leaving brown

crusts. Ten to twenty days is the average duration of an attack. The distress may be very slight or overpowering. These neuralgic pains occurring before the eruption manifests itself, may give rise to the diagnosis of pleurisy, pleurodynia, or other localized suffering until the characteristic eruption of zoster makes the diagnosis clear. Of late years herpes zoster is being regarded as a more complicated affection than for a long time believed. The causal factors are: (a) Inflamed state of the nerves, ganglia, nerve-trunks, branches, or filaments; (b) Season—most frequent in winter; (c) sudden temperature change; (d) infection; (e) internal use of arsenic (Hutchinson); (f) traumatism following injuries or surgical operations.

The **diagnosis** of herpes zoster can be made upon the prodromic neuralgic pain, the vesicles tending to cluster in distinct groups upon a highly inflammatory base, and occurring on a nerve-track, and the vesicles preserving their form intact. In eczema the lesions exude moisture, break down, and form crusts; in herpes zoster there is no discharge unless the vesicles are ruptured; they dry up and form crusts. Eczema itches; herpes zoster burns.

The **treatment** of herpes zoster is largely palliative; it is an acute, self-limited disease, running a very variable course. The neuralgic pain in children may be entirely absent, and if it is present, is liable to subside as the eruption becomes established. The great point is to prevent the vesicles from rupturing, to exclude the air, and prevent the irritation of the clothing. Internally, the coal-tar analgesics are usually efficacious to control the pain; a powder of—

R. Acetanilid or phenacetin,	3 grs.
Sodii bicarb.,	2 grs.
Caffein,	$\frac{1}{2}$ gr.
Codein,	$\frac{1}{10}$ to $\frac{1}{6}$ gr.

every three hours is useful for a child of ten; sometimes morphin is necessary. Bromids may be needed where nervousness is extreme.

R. Pulv. camphore,	gr. x
Pulv. talc,	℥j.

Sig.—Use locally.

This dusting powder should be held in place by a large wad of cotton-wool to keep the whole from being moved about on the hyper-sensitive surface, and to avoid rupturing the vesicles as infection may take place in the broken-down lesions and scarring result.

For localized patches, menthol or resorcin in gutta-percha or collodion are excellent protectives. For extensive areas, especially about the gluteal folds, in the axilla, lotions, as of laudanum, laudanum and lead-water, or fluid extract of *grindelia robusta* give comfort. On limbs which must be used, ointments can be made to serve a good turn, or oil of peppermint, or chloral camphor painted on, over which a large shielding wad of cotton should be placed and firmly attached.

An important point in treatment is the residual neuritis, for which galvanism gives relief, or sometimes blisters on the central side of the nerve affected.

IMPETIGO CONTAGIOSA.

Impetigo contagiosa is a highly contagious auto-inoculable disease very common among children and almost entirely confined to them, running its course in about ten days or two weeks, and tending toward recovery. It may be defined more accurately as an acute, inflammatory, contagious disease, characterized by the formation of one or more superficial lesions, round or oval in shape, beginning as vesicles and rapidly becoming pustules which pass into crusts. At first the vesicles stand alone and are small in size, but soon spread out until they become the area of a small coin, over the top of which is spread out a thin membrane soon becoming collapsed and withered looking. There may be few or many of these, alone or coalescing, especially about the angles of the mouth and around the ears or nose. In a few days yellowish or straw-colored crusts form which have the appearance of being loosely stuck on the skin, and are readily pulled off, leaving a moist, bleeding, or inflamed surface underneath. The course is about ten days, but we have seen it run along for weeks in much the same locality, doubtless by progressive auto-inoculations. This last is a very common method of extension, and we have frequently seen painful lesions on the body, about the buttocks, or under the armpits, and particularly on the lower leg, which could be directly traced to an earlier mild attack of impetigo, beginning upon the face, for which no treatment had been sought. The cause is staphylococci flourishing on a favorable soil. Impetigo is so well marked a disorder in its distribution, occurring as it does usually on the face and hands and beginning as flat flaccid vesicles or vesicopustules, the dirty

appearance of the pustules, the yellowish-brown, loosely attached scabs or crusts, the absence of itching, there are so constantly two or more children in a family affected with it at the same time, or an easily obtainable history of neighboring infection, that there should be little difficulty in differentiating it from pustular eczema, scabies, or that rare and illusive entity known as simple impetigo.

Treatment.—Impetigo contagiosa may get well of itself if left alone; but this the child will not do, but cherishes it and extends it all over his person by his hands or finger-nails, or transfers it to his little companions. It is important, then, to use some cleansing measures, of which soap and water do very well, but antiseptic washes, such as boric-acid solution, are even better. There is no itching to contend with. Ammoniated mercury, ten to twenty grains to the ounce of boric-acid ointment, will usually suffice. The removal of the crusts and the application of some astringent antiseptic wash or ointment to the moist, inflamed surface will hasten the cure.

MILIARIA.

Synonyms.—SUDAMINA; MILIARIA CRYSTALLINA; MILIARIA RUBRA; MILIARIA ALBA; LICHEN TROPICUS; PRICKLY HEAT.

Miliaria is an affection due to an obstruction of the sweat ducts, either with or without inflammation. Sudamina or miliaria crystallina is the non-inflammatory form. The fluid contained in the vesicles is pure sweat. Owing to the orifice of the duct being plugged by an obstruction, the sweat is effused under the horny layer. The vesicles are pin-point to pin-head in size, closely crowded, but rarely confluent; their color is clear or pearly, occurring mostly on the neck, chest, and abdomen. They resemble dewdrops. This variety occurs often in the course of typhoid and rheumatic fevers, especially by a "critical sweating." The fluid is absorbed in a few days, leaving slight desquamation.

Miliaria Rubra et Vesiculosa.—This is the inflammatory form. The inflammation may be primary or secondary, and develops in the sweat-pore area. When we have bright red papules only it is miliaria rubra; when we have vesicles or pustules on the summits of the lesions it is miliaria alba.

The lesions occur chiefly on the trunk, pin-point to pin-head in size,

closely crowded, but discrete. There is usually a diffuse redness of the affected area; more or less itching is complained of, most marked in the papular variety.

The affection runs its course in a few days, leaving slight desquamation, though successive crops may continue to appear. "Red gum," or strophulus, of infants is miliaria rubra due to too warm clothing.

Miliaria papulosa, or "prickly heat," or lichen tropicus, is another variety of miliaria rubra. Here the inflammatory process is primarily in the sweat glands, and causes obstruction of the sweat ducts. The eruption consists of bright red, minute, closely crowded, but not confluent acuminate papules, with a few vesicles and vesicopapules scattered about between them. The eruption is preceded by profuse sweating, comes out suddenly, and is attended with intense itching and pricking. It mostly affects covered parts,—trunk, limbs, and upper part of forehead,—and is usually extensive. Prickly heat is most common in the tropics, but occurs in America during the summer. Too warm or ill-fitting clothing, the irritation of clothing, especially flannel, rapid alterations of temperature, seem to be predisposing factors. Children, fat people, and those who perspire freely are most liable to it. One attack predisposes to another.

Diagnosis.—The non-inflammatory, pearly vesicles of sudamina can scarcely be confounded with anything else. Miliaria vesiculosa may be mistaken for vesicular eczema, but in the latter the vesicles rupture spontaneously; they form in patches, oozing is usually marked, and the process has a marked tendency to spread, and is more chronic in its course. Miliaria papulosa, occurring only in hot weather, its sudden onset, associated with excessive sweating and the eruption confined to the sweat glands, the minute papules, peculiar pricking instead of intense itching sensations,—all differentiate this from eczema papulosa.

Differential Diagnosis.—Sweat rashes occurring in children are liable to be mistaken for some of the exanthemata, but the absence of the usual constitutional symptoms of measles, scarlatina, and r  theln, and keeping in mind the localization of the eruption and the accompanying sweating, will usually make the diagnosis clear.

The **prognosis** is good, the disorder generally yielding to appropriate treatment.

Treatment.—Saline diuretics—acetate and nitrate of potash—

and lemon and lime-juice drinks are very useful. Locally, alkaline and bran-baths are beneficial; soothing, cooling, or evaporating lotions will afford relief. We have used with marked benefit the lotion resorcin cum bismuth (see Eczema) and the lotio calaminæ (see Erythema). Dusting powders of zinc, starch, and boric acid are useful.

PEDICULOSIS.

Pediculosis (lousiness) is a parasitic affection caused by the presence of lice. There are three varieties of pediculi—of the head, body, and pubes. The diagnosis is easy, and the scratch marks must be carefully searched for. In the scalp and pubes, nits or ova will be conspicuous. The parasite attacks the scalp and produces considerable irritation, which causes the patient to scratch, then follows effusion of serum, blood, or pus, the hairs becoming matted together. Pediculosis is a common cause of eczema in the back of the head. Sometimes a characteristic form of eczematous eruption can be seen about the mouth, nostrils, and ears, due to lice, but closely resembling impetigo contagiosa.

The **treatment** for head lice is to apply kerosene or tincture of cocculus indicus over night, and wash the hair with soap and water in the morning. This will kill the insects, but does not destroy the nits. Vinegar applied will soften the ova and aid their removal. The hair need not be cut if care and patience are used in applying the remedies.

Body lice produce considerable itching, which is usually followed by extensive scratches. Cleanliness with soap and water is usually sufficient in the care of children; the underclothes must be baked or boiled. This insect lives in the clothing and only goes to the body to feed. A carbolic lotion may be necessary to relieve itching.

The crab louse, though usually found on the pubes, is also rarely encountered in the axilla, and in children sometimes in the eyebrows and eyelashes. This insect may be removed by cocculus indicus of full strength or diluted one-half, followed by vinegar or hot soapsuds.

PITYRIASIS ROSEA.

Pityriasis rosea is a slight affection, self-limited and harmless, but worth mentioning because it is frequently mistaken for more impor-

tant disorders. It is characterized by discrete or confluent macular or maculopapular lesions, from a pinhead to half-dollar size; in color a rosy or pale red, with a more or less tawny or yellowish tint. The surface may be slightly or not at all raised, always dry or scaly, healing in the center and spreading at the edge, and when there is caused a ring-like appearance it may be confounded with *tinea circinata*. The eruption is usually seen under the clavicles, on the side of the chest, or between the shoulders. It may be mistaken for syphilis, *tinea versicolor*, *tinea circinata*, or *seborrhea corporis*; it may last from one to three months. It is not contagious, and requires little treatment, except, perhaps, a mild, stimulating ointment such as—

R. Acid. salicylic., gr. x
Sulphur precip., gr. xx
Ung. aq. rose, ʒj.

PSORIASIS.

Psoriasis is a chronic inflammatory disease of the skin commonly showing itself in the form of variously sized scaly patches scattered over different parts of the body; these patches are usually rounded, sharply defined, and consist of a mass of imbricated "mother-of-pearl" scales on a red base. When the scales are picked off there is shown underneath a smooth, shiny, reddish surface, on which may be seen a few points of blood. Psoriasis is always dry and scaly, never moist. It may occur in any part of the body, but most commonly on the extensor surfaces of the limbs, and especially on the knees and elbows. The back is a favorite situation, and it is frequently seen in the scalp. It is non-contagious, and may occur in healthy, well-nourished people who are slightly rheumatic. It is almost always symmetric; there is, as a rule, little or no sense of itching. In children the lesions are usually small and rather generally distributed. The elbows, knees, and scalp are liable to be the first parts attacked. A diagnosis needs to be made between psoriasis and *seborrhea*, *eczema*, and *syphilis*. In *seborrhea* of the scalp the scales are greasy and yellowish and limited to that region and the scaling or crusting is diffuse and not in patches. In psoriasis the scales are situated on inflammatory bases and occur in patches which are circumscribed. In the squamous syphilides

it should be noted that these are rarely confined to the joints and flexures where psoriasis in children is usually seen.

The **prognosis** is favorable for the cure of the existing lesions, but as the disease is very liable to recur sooner or later, a guarded opinion as to ultimate cure must be given.

Treatment.—Internally, the chief remedy is arsenic, which is of undeniable value, and is well borne by children. It should not be used if the lesion be highly inflammatory and rapidly spreading. The scales should be removed before local treatment is attempted. These may be removed by rubbing in, with a rag, *sapo viridis* and hot water, or by the use of a hot-water-and-soda bath.

About the face and the scalp a good ointment is, ammoniated mercury, twenty to forty grains to the ounce of lanolin. Chrysarobin is most efficacious, but should be used with caution, as it may set up a spreading dermatitis. A good application is:

R. Chrysarobin, 10 grs.
Salicylic acid, 20 grs.
Liquor gutta percha, ʒj.

SIG.—Apply with a camel's-hair pencil every third or fourth day, to be followed by a bath.

Another good application is tar, ʒj to ʒiv ad. petrolat. ʒj.

PURPURA.

Purpura consists in the development of variously sized and shaped, reddish, usually non-elevated hemorrhagic patches, not disappearing under pressure. The several varieties of purpura are: (1) *P. simplex*; (2) *P. rheumatica*; (3) *P. hemorrhagica*.

P. Simplex.—Rarely any premonitory symptoms; apparently spontaneous hemorrhages make their appearance suddenly—often during the night. They most frequently appear on the lower extremities, especially on the flexures, but Crocker has observed them in children occurring first upon the neck and upper part of the back, and even in the mouth. The lesions are pin- to pea- or bean-sized; they are usually rounded or oval, but may be irregular in shape. Usually they are symmetric—come out in crops. At first they are bright red. This redness gradually fades to purple, bluish-greenish, or dirty yellow (the same changes that take place in an ordinary bruise). They disappear slowly by absorption, leaving a temporary pigmentation.

The course of this variety varies from a few days to a few weeks.

Prognosis.—Good.

Treatment.—None usually required. Rest is advisable.

P. Rheumatica (Peliosis Rheumatica).—This is, like some cases of erythema nodosum, an affection of rheumatic nature. The cutaneous lesions are secondary to the constitutional conditions underlying. The disease is usually ushered in with more or less fever, loss of appetite, depressed spirits, and severe rheumatic pains, especially about the joints of the lower extremities.

In a few days the purpuric spots appear in patches, especially in the region of the joints in which the pain is most severe. When the eruption appears the pain in the joint frequently abates or, it may be, entirely ceases. The patches are bright red at first, but do not fade on pressure. They disappear, as in *P. simplex*, changing color, becoming purplish, etc., as in a bruise. This disease usually occurs in middle age, but it is not unknown in children.

This can hardly be confounded with any other disease, as the combination of pain in the joints with cutaneous hemorrhages around them makes the diagnosis clear.

Cardiac trouble may arise in the course of this disease, and may become permanent.

The **prognosis** for uncomplicated cases is good. If grave complications be present, a guarded one is to be given.

Treatment.—Rest in bed. Getting up too soon may cause a recurrence of the hemorrhages and pains. Salicylates are indicated and should be pushed. Quinin, iron; a liberal diet, and strict attention must be paid to the hygiene.

P. Hemorrhagica (land scurvy) may develop from *P. simplex*, and it may be regarded as a severe and exaggerated case of the same. Usually premonitory symptoms of a decided character usher in this affection—headache, general debility, and even convulsions (Crocker). The spots generally appear suddenly on limbs; the mucous membranes are also involved—mouth, nose, bladder, vagina, etc. These hemorrhages may be so profuse as to lead to exhaustion or death, or, on the other hand, they may be moderate. They may continue for a few weeks or so, or gradually cease altogether.

This type of purpura is usually seen in debilitated subjects or those in a depraved state of health.

Treatment.—Enforce absolute rest in bed ; sustain the strength by nourishing and easily assimilated diet. Ice internally and externally may be useful. Calcium chlorid, owing to its property of increasing the coagulability of the blood, has lately been highly recommended.

SCABIES.

Synonym.—ITCH.

Scabies is a contagious parasitic disease, due to the *Acarus scabiei*, characterized by a multiform eruption of a peculiar distribution and the presence of cuniculi (or burrows), which, if found, are pathognomonic. The depredations are wrought by the female, who burrows just below the surface of the skin, deposits feces and eggs, and there dwells. As soon as the young are hatched they start out energetically likewise to burrow. These burrows are seen as zigzag or straight dotted elevations of the epidermis, and are found between and on the sides of the fingers and on the flexure surface of the wrist ; also on the penis in males.

As the mite seeks warm, moist, and protected places for its habitat, this disease therefore has its own peculiar distribution—viz., between the fingers, on the flexor surfaces of the wrists, anterior folds of the axillæ, on the abdomen, and buttocks. Except in infants and young children, the face and scalp are free.

The **diagnosis** is usually easily made from the history of contagion often given, the peculiar distribution of the dermatitis, the multiformity of the lesions (burrows, vesicles, papules, pustules, scratch marks, and blood crusts), the marked itching, especially at night, and (except in infants) the freedom of the scalp and face from invasion. In children the burrows are usually readily found, and when seen they are pathognomonic.

Treatment.—The itch itself is not difficult to cure, but the resulting eczema or dermatitis may be troublesome. Too little treatment on the one hand, and too much or too vigorous on the other, is to be deprecated. For the dermatitis resulting from the irritating applications, see Eczema and its treatment.

The first thing to do is to give the child a thorough bath in hot

water and soap, and then apply the following ointment every night for four nights, rubbing in thoroughly from head to feet :

R. Sulph. præcip.,
Bals. peruv., aa . . . 5j
Petrolat., 3j.

Or,

R. Beta-naphthol, 3^{ss}-5j
Unguentum adipis, 3j.

Sulphur is the old standard, one or two drams to the ounce of lard. Either of these may themselves produce an additional irritation in tender skin. In young infants styrax is to be used.

R. Styracis liq., 3j
Ol. olive, 3ij.

Sig.—Apply at night for two or three nights.

SEBORRHEA.

Seborrhea is a functional disease of the sebaceous glands of the skin, characterized by an increase in the amount of sebum poured out or an alteration in its quality in the form of oily, scaly, or crusted material. There are two varieties, seborrhea oleosa and seborrhea sicca.

Seborrhea oleosa appears in the form of a greasy coating on the skin, most commonly on the scalp and face.

If the vernix caseosa of the new-born continue it may pass into seborrhea, and this if neglected may run into an eczema. Smegma of the genitals is a form of the same disorder, and if excessive or unre-moved it produces considerable discomfort. The treatment of seborrhea is both constitutional and local, those suffering from the disorder being usually in a depraved state of health. After infancy it is most likely to appear about the time of puberty. Functional disorders should be attended to and nutrition kept at a high plane. The local treatment consists of removing the scales and crusts. The best application is: Acid. salicylic., grs. xv; petrolat., 3j; soaking them over night and then washing with hot water and Castile soap.

Sulphur is the most reliable remedy for seborrhea, \mathfrak{zj} ad. petrolat. \mathfrak{zj} in an ointment rubbed into the scalp. The German superfatted sulphur soaps form an elegant mode of applying sulphur to the scalp. They can now be had in most drug shops.

TRICHOPHYTOSIS CIRCINATA.

Synonym.—RINGWORM OF THE BODY.

Ringworm of the body is a contagious, vegetable parasitic disease, due to the presence of minute spores and mycelia or threads growing in the skin, and giving rise to one or more circumscribed, circular, variously sized, inflammatory, squamous patches, occurring on the general surface of the body, and may be accompanied by itching.

Ringworm begins as a small, reddish, scaly, rounded spot, which in a few days assumes a circular form, healing in the center as it spreads on the periphery, hence its name of "ringworm"; it occasionally is papular or vesicular. It appears on any part of the body, and is transmitted by contagion. It is acquired from domestic animals,—horses, dogs, and cats,—and children are more susceptible than adults.

The treatment of trichophytosis circinata is cleansing with soap and hot water twice a day, and an ointment is then to be rubbed in of ammoniated mercury, fifteen to thirty grains to the ounce, or a clean and agreeable lotion may be used of hyposulphite of sodium, one dram to the ounce of water, or tincture of iodine. Ringworm of the non-hairy portions is readily cured.

TRICHOPHYTOSIS TONSURANS.

Synonym.—RINGWORM OF THE SCALP.

Ringworm of the scalp is a disease of childhood, exceedingly rare after sixteen and not met with in the adult. It is the same disease as ringworm of the body, described above, occurring on the scalp; it appears as one or more circular, more or less circumscribed patches, like "a plucked goose-skin," covered with gray scales and numerous short, broken-off stumps of hair. The patches of alopecia areata are smooth and non-inflammatory. The disease is highly contagious

among children, and is most obstinate in its course. The fungus is in the follicle, in the roots of the hair, and also in the hair shaft, and is difficult to reach. The fungus must be reached, and with remedies sufficient to kill it without destroying the surrounding tissues.

The hair must be plucked out of the patch, cut short an inch around the patch, and the scales cleansed from the scalp, the diseased, broken hairs pulled out by forceps, and then the parasiticide applied. The epilation must be daily, and, even though it may be incomplete, yet it opens up a pathway for the fungus destroyer.

Parasiticides are indicated, and the best are sulphur (5j-5j), beta-naphthol (5j-5j), tar, pure or diluted; a bichlorid wash, 1 : 1000.

The **prognosis** of ringworm of the scalp must be very guarded; from three to five months is a reasonable time to effect a cure.

TINEA FAVOSA.

Synonym.—FAVUS.

Favus is a disease of the skin and its appendages, due to a vegetable parasite, the *Achorion Schönleinii*, most commonly seen on the hairy scalp, yet occasionally elsewhere on the body; sometimes upon the nails. In appearance favus resembles a mass of sulphur-yellow scales, elevated above the surface of the scalp, in the form of thick cups or crust (these cups are pierced by a hair, and are composed of almost pure fungus), destroying the luster of the hair, which, gradually falling out, leaves irregular areas of baldness. It is accompanied by a peculiar odor like that of mice; upon the general surface it usually commences as a series of vesicles surrounded by inflammatory areolæ. The disease generally begins in childhood and may persist for years or throughout life; there is usually slight itching. The disease exists in many of the lower animals, and is probably often thence conveyed to man. The *Achorion Schönleinii* invades the horny layers of the skin, the root sheaths of the hair, and even the hair itself. Well-developed favus is not difficult to diagnose; placing suspected crusts under the microscope (add a drop of potassium hydrate) will make the diagnosis clear at once.

The **prognosis** of favus is uncertain; relapses are prone to occur, and in long-standing cases scarring is liable to occur, and therefore the loss of hair is permanent.

Treatment of favus requires much time and perseverance; some cases get well promptly, most do not. Improvement in hygiene is the first thing, but the treatment of the disease is purely local. The crusts must be removed. This is best done by soaking the scalp for a night or two in sweet oil and then scraping them away. The hairs in the affected areas should all be pulled out, as by this means not only the superficial but the deeper portions of the fungus are removed, and a way is opened for the entrance of medicaments. The local treatment is antiparasitic. A lotion of bichlorid of mercury, two to four grains to the ounce of alcohol, mopped on once a day, and followed by a weak parasiticide ointment, applied constantly, such as tar, carbolic or salicylic acid, sulphur or diverse preparations of mercury, are efficient. Every two or three days the head should be shampooed with liquid soap, made thus:

R. Saponis olivæ præp. ʒ iij
 Alcoholis, ʒ iij.
 Sig.—A tablespoonful for each shampoo.

To be followed by:

R. Beta-naphthol, ʒ j
 Petrolat., ʒ j. M.
 Sig.—Apply.

URTICARIA.

Synonyms.—HIVES; NETTLE RASH.

Urticaria is an inflammatory disease of the skin, characterized by the development of wheals, which are of various sizes and shapes, fugitive and ephemeral in character, white or reddish, accompanied by painful pricking and tingling sensations, and usually slightly elevated above the skin. On the face it may produce great disfigurement; a single part, as the lip, may become enormous. The disturbances of sensation may be merely annoying or overwhelmingly painful. The name "nettle rash" alludes to its similarity to the sting of a nettle. The lesions may appear in almost any part of the body and shift about constantly. If the disease attack the epiglottis it may threaten life. The duration depends upon the persistence of the cause. The forms of urticaria are the papular, hemorrhagic, bullous, or urticaria tuberosa, or giant urticaria. It may become chronic, the

lesions coming and going in repeated crops. The causes of urticaria are many and diverse,—external irritants, as the stings of insects and jelly-fish, and internal causes, the secondary effects of intestinal derangement. Certain articles of food produce it in those predisposed, especially shell-fish, the sea scavengers, such as lobsters and crabs, which frequently contain unusually severe poisons acquired from the carrion on which they feed. Some berries produce it in the susceptible. Exciting causes may be sudden emotion or excitement. The treatment depends chiefly on the discovery and removal of the cause; some susceptible individuals have the disease developed within a very few minutes after tasting certain articles of food. We know a child, now twelve years old, who for years has been so sensitive to any portion of egg that to taste an article which contains this will produce, in a very few minutes, swollen lips and throat, and if any considerable amount be swallowed, hives will develop in less than an hour. In certain cases of suspected poisoning it is wise to administer an emetic; in all cases it is better to give a purge. A saline laxative is best, as being quickest, but it is well to follow this by some thorough cleansing agent, as castor oil. Then the intestines require critical and deliberate attention. Diuretics are often of use; the natural mineral waters and various sorts of eliminants and intestinal antiseptics; pilocarpin by mouth or under the skin is of value. Quinin is admitted by all to be a useful remedy, for known or unknown reasons. Arsenic is often of service when all other remedies fail. Codein is an excellent quieting agent. Externally, alkaline baths are of great comfort, followed by soothing powders. Vinegar and water, alcohol and water, carbolic acid and glycerin lotions relieve. Chloroform, a dram to the ounce of alcohol; ammonia and water, especially bran-water, each have their sphere. In the subacute or chronic forms ointments come in happily. (See the treatment of Eczema.)

CHAPTER XIX.

GENERAL CONSIDERATIONS ON PHYSICAL DEVELOPMENT.

WITH SPECIAL REFERENCE TO CHILDREN OF FEEBLE POWERS AND LOWERED RESISTANCE.

The upbuilding and repair of all children, especially those who are weakly or convalescent, should be considered on broad principles, the basis of which is elaborate thoroughness and abundance of time. This involves special attention to dietetics, including a critical estimation of varying states and capacities of digestion, all the ordinary hygienic measures, and the hopeful use of some drugs. There must be insisted on for such, both during average health and during illness and convalescence, more rest for the mind and body than is necessary for the average child. All outings and exercises, both active and passive, should be supplemented by rest, lying down for as long a time, it may be minute for minute, as the active periods. This rest is necessary to enable lowered organic processes to regain their customary tone, and especially to secure definite gains. It will often be necessary to precede food by a period of rest, to enable the digestive activities to do their work; otherwise the highly sensitive nervous distribution to the digestive apparatus will fail of its full energizing. Agitation impairs the even flow of the circulation so necessary for weakened organs, particularly the brain, whence governing impulses perpetually flow, dominating the body and spirit. Therefore, too, the emotions must in the weakly be not only kept well under control, but subjected to the least possible disturbance or exaltation. The temperaments (or mental attitudes from which they view life) of all children require steady and patient training. Even in the home a clear recognition of these is needed. In the case of strong children, equipped with clear, dominant, healthy minds, it is undoubtedly true that fair results come somehow from very diverse and ill-directed influences; but for the

weaker ones, impressionable or apathetic, thorough conscientious study and specially directed measures are required.

For such little folk it is not enough to prescribe suitable medicines and enumerate casually a lot of easily digested foods which the mother shall provide, nor to direct proper bathings, outings, and other general measures. A thorough systematization of the entire daily life of the child is infinitely more efficacious than the most accurately selected medicines or the use of that innumerable host of children's foods with which, in the form of specious descriptive circulars, the enterprising chemists flood our morning mails. The best tonic for the stomach is food carefully prepared, such as a fairly intelligent mother in even the humblest walks of life, if rightly directed, can readily afford, but always provided that the careful preparation, the times and circumstances of administration be wisely chosen and rigidly adhered to.

Predigestion of food-stuffs offers undeniable safeguards to the weakened, toneless digestive tract, but robs the pabulum too often of that savoriness which is essential to acceptability, and hence imperils appetite.

While exercising care as to the quality and preparation of foods for weakly or convalescent children, it is imperative to bear in mind the need for suitable variety. This fact we have time and again verified. A child will often be presented who is fed with the utmost care and regularity, oftentimes under the best of medical advice, and yet its progress comes to a standstill, or it is seen to obviously retrograde. Upon inquiry there will be revealed much sameness in the diet list, otherwise properly adjusted to the condition for which it was originally outlined. The little victim's soul comes to loathe and abhor the sight of flabby paps, occurring in dismal routine, or the same old wearying round of bread, meat, and a dab of vegetables. If to these are now added a more varied dietary, revising the menu day by day, even lapsing into a taste, now and again, of articles ordinarily forbidden yet savory and tempting, great progress will soon be obvious.

The growing practice of sterilizing milk for infants and children, invaluable as this protection is for temporary use during hot weather in cities, often leaves anemia and tonelessness, even scurvy, in its train if its use be persisted in. There is a value in the vital properties of fresh milk not to be produced or retained by any artificial process.

The utmost care needs to be observed, however : first, in the quality

of the milk, which includes an estimation of the health of the cow ; secondly, strict regulation as to the treatment of the milk while being gathered and immediately thereafter, and, finally, the greatest conscientiousness in securing cleanliness of the containing vessels. These conditions, though difficult, are becoming more and more possible as knowledge grows, and if fulfilled will bring a perfect article to the consumer.

The points which certainly do not obtain adequate attention are the thorough systematization of the when, where, and how much of these foods shall be taken ; what *varieties* shall be insisted upon ; the times, kind, and suitability of bath, the amount and character of exercise, and, above all, definite periods of *rest* before and after feeding, so that the organs shall be able to act deliberately. First, then, when confronted with an ailing child, one who is not ill, but far from well, when appetite is variable but small, when sleep is restless, the digestive organs manifestly disturbed and temper fretful, one that fails to hold its own in play among its fellows, and, what may not be ignored, whose weekly school report shows decided backsliding—first, look the little fellow over thoroughly and in all respects.

There may not be one organ more amiss than another, though the most obvious faults will usually be seen in that avenue to all vital power, the *prima via*. There may be yet no falling off in weight, a far more instructive index in a child than in an adult, nor an obvious anemia. There may be a quicker pulse than ordinarily, a change in the heart-sounds which the initiated will recognize but can not so clearly describe ; there probably will be found, if so much trouble be taken, a rise in temperature, slight but unmistakable at times, at others subnormality well marked, and there is great probability that neither the attention nor other exertion is readily sustained. The child, in marked contrast to its healthy comrades and itself at other times, is willing to sit aimlessly, if not a martyr to energetic task-masters, or to an overstrenuous conscience which drives its willing victim to the verge of perpetual exhaustion, and often over it into the pit of complete collapse.

Such cases as here pictured are common enough, if only the eyes are open to see them. They escape attention only too readily till some malady seizes them in all their pitiable weakness, and life is speedily quenched. It is a worthy quest, then, to seek out and

rescue these from, it may be, no picturesque fate but an ever-present menace; to rehabilitate these unresilient little bodies, and even make them better than before; to put them in the way of a sound bodily equipment for their life-work anon.

Here is a sketch of modified rest treatment which produces excellent results when all other efforts have failed to start a child along the line of progress. Put the little one in bed from a few days to a week or more, and write down distinctly for the mother a strict schedule, giving the exact hours for feeding. These may be the ordinary three meals with some little fluid food taken in between whiles, or, better, direct four meals to be given in the day, at, say, seven, twelve, four, and eight o'clock, the largest meal at noon. Omit the tonics hitherto given and add digestive ferments, or malt, or both. Let the day begin with a sponge-bath in a warm room; then a light breakfast, daintily served. In the early afternoon let some one rub into the trunk and limbs an oil; olive oil is very nice and much of it is thus absorbed; cod-liver oil is better, and not disagreeable if free from rancidity and one-third part soap liniment is added, which probably aids the osmotic action. Lanolin, diluted, is best of all; changes are desirable in all skin applications. This serves as a form of passive exercise and also a nutriment, or at least a tonic to the skin, circulation, and cutaneous nerves. The surface should be thoroughly wiped off afterward that no foulness remain. We have seen children immensely benefited, even among the poorest dispensary cases, from this one measure alone. Above all, in the early course of these measures, if the child manifest a desire for toys they may be allowed sparingly, but aggressive entertainment by overofficious persons is a harm and an offense and should be strictly forbidden. After a few days or a week the range of one sunny room may be permitted, but still the child should be let alone, and in most cases it will be happy and amuse itself.

Frail children require systematic development of their various organs, as well as of their muscles. To be sure, it seems scarcely practicable to increase the power of some organs, as stomach or kidney; nevertheless it is possible to do so. It is abundantly obvious that the eye and the skin can be developed, and it is equally important that all these organs should receive attention in the aggregate and separately, especially where there is a manifest under-development of the one or the other, which then should receive specific attention.

To take first the eye. An infant can sustain very considerable damage to its eye by objectionable exposure to light, which may be too strong, or too sudden, or too constant. It may readily have its eye-muscles disturbed by an habitual attitude, as when, by reason of a weak back or other disability, it is confined to a single place, as a chair, in a customary situation in the same room, straining vision in one way, and many other objectionable practices which common sense and observation will make evident. By the same token, this eye or pair of eyes may become developed, not only in their organic capacities, in the judging of distances, inviting refractive adjustments, etc.; but, as intelligence increases, great good can be accomplished by a thoughtful use of interesting objects which may excite the child's wholesome interest and educate its perception.

There are experiments now afoot, at least promising well, by which children can be taught so to perceive differences of color, in form, and the arrangement of objects, as will greatly facilitate their comprehension of natural phenomena. It is quite possible that along this line may be found means to prevent defects of sight, such as color-blindness, as well as to check the progress of myopia and other refractive errors. There is great unwisdom in submitting babies to rapid journeys, and looking out of windows at swiftly passing objects while flying along. We have seen migraine apparently develop through the custom of giving a couple of small children long exercise in a carriage with a pair of fast horses every day. We have certainly seen instances of profound disturbance caused by this means, and it is reasonable to infer that a continuance of such-like objectionable measures may produce lasting damage upon so delicate an organ as the eye, and the whole sensitive organism thus is imperiled.

The custom of encouraging a child to sleep while being driven about is unwise. The motion is both tiresomely regular and subject to sudden irregularities. The persistence of one kind of motion up and down is bad, not only producing relatively unsound sleep, but keeping up a molecular agitation throughout, which has little to recommend it. If the infant be awake and sufficiently old and alert to sit up and look about, or to be forcibly held by the nurse in an upright position, a strain is put upon the spinal column. Thus continuous mild concussions are administered to the spinal cord and brain; thus the eye is put upon the strain, reacting directly upon the brain; an element of

excitement is introduced and physiologic irritability is a probable result.

The heart is capable of much improvement, and demands the closest attention to varying states. If a baby starts out with an organically sound heart and succeeds in getting its whole mechanism so developed (by living under wholesome conditions, which involves some systemic training, whether this come by design or accident) as to steadily increase its vigor and competence, then the heart will be the very foundation of future power and the ground of reliance when illness or strains come. It will serve valiantly to the end of great age, spent under manifold exigencies, both physical and mental. In the repair of damaged hearts mental rest is of more importance than physical inactivity. Moreover, there are more perilous cardiac states than valvular diseases, though they may not be so demonstrable. Judicious attention to a weak or damaged heart can accomplish much and is best in the line of regulated activities.

The development of the skin is of paramount importance in the young, as upon its capacity to endure changes in temperature and other states will depend much of the future healthfulness of the individual. Some children have the layers of the skin unformed from the first, and it never acquires normal activity. There is quite a large variety of skins obviously different to observant persons—the firm, glossy, or velvety skin of health, the pallid, flabby, or leaky skin, readily becoming overmoist, loosely attached and wrinkling readily, or the yellow, harsh skin, either flabby and toneless, or stiff and inelastic, adhering to the bone, or seeming to do so. Some skins are insensitive and react to almost no stimulant; others chafe and get out of order if only thin clothing press upon them, hypersensitive to the simplest hurtful agencies.

The skin of a red-haired child is always tender and usually beautiful. Children predisposed to tuberculosis or scrofulosis have poor skins, which can be and should be immediately improved. Various neuroses show in the skin. In short, the surface of the body is of vast activity, and the cultivation of this large part of the organism is of critical importance.

Now as to the means of improvement in our control. We believe if babies were anointed from the first with oil, and cleansed by rubbing them off, not using water, or but sparingly, for weeks or months,

their skins would become more vigorous than when soap and water are freely used. This we have proved by a series of cases observed (and published), three of whom were our own offspring. Exposure of the skins of infants to the air of an equably heated room is wholesome, and they are better for as much exposure as possible, always short of chills. In America we are subject to such sudden and extreme changes that we dare not allow this as freely as is safe in many other countries. The exposure of knees and shoulders in children not the most robust is dangerous, unless carefully watched and promptly covered at the approach of chilling conditions. Indoors it is of use, outdoors not to be recommended to all. To go barefoot is wholesome for many. Almost never do children hurt their feet, and thus only are the feet symmetrically developed. They do not increase in size seriously. We know of numbers of Southern girls with feet entirely beautiful who ran barefoot in warm weather until they were almost grown.

Cautious and repeated exposures induce an increasing tolerance of the skin which will greatly strengthen the whole organism. The clothing at no time should be one bit more than necessary to protect. Over-swathing lessens energy; it throws the volatile elements of excretion back into the blood and thus directly poisons. The skin should be able to throw away entirely and promptly its effluvia, which should be offered free escape, or its retention may damage the lungs or kidneys. When we bear in mind the capacity of the surface blood-vessels, and how greatly vascular dilatation or contraction alters the state of the varying blood-supply to internal organs, also how large is the amount of matter excreted by the skin, and many other points involved in its functional activities, we at once recognize the importance of preserving its integrity at all times. If these activities are anatomically undeveloped or functionally impaired they demand our closest attention. Natural means are best, judiciously controlled. Exposure is important, always with caution. Bathing should be frequent,—daily, indeed, or in hot weather oftener,—in as cool water as can be enjoyed or well endured, but gradually lowered if unaccustomed. Bathing should be followed by thorough drying and rubbing and prompt covering; weakly folk should lie down awhile after. If chilled, let them get into bed for a time till complete reaction comes or fatigue goes. When bathing can not be so well endured, at least so often as may be

indicated, then a dry rub will suffice, especially after exertion and exceptional opening of the pores. If all this tires the child it should lie down, and the work be done for him by another person. Soaps are to be used sparingly and only for cleansing. Salt is almost as cleansing and more stimulating. If the skin is tender, bran decoctions added to the bath will soothe. Ammonia or sulphur added to the water has value, rendering it soft and exerting special effects. To begin cold bathing, let one unaccustomed stand in three inches of warm water and be sponged off in cool and cooler water. The custom of the Greeks to exercise naked anointed with oils has much to commend it. The rolling in the sand of the arena in wrestling was accredited with benefit, and no doubt rightly. Wading at the seashore and digging in the sand is analogous, and much to be commended if not too prolonged. Swimming comes next to bathing, and is among the finest agencies for invigoration of skin and muscles. Remaining long in the water, above half an hour, is of doubtful value, and over an hour is a strain, and for several hours is hurtful to any but the strongest, and does them no good. Water colder than the air of the bath-room is often hurtful for the strongest and of little or no value to any. Shower-baths and needle-baths are terrifying to most children, and possess no advantage over sponging or plunging. It is best for little folk to encourage cool bathing by gentle gradations, and to make of it a reward or frolic. The air of the bath-room should be warm.

The exercise of the lungs next to the skin requires much attention. First, it is necessary to make sure that the avenues to the lungs—the nose and throat—shall be clean and healthy. Upon proper lung-action depends the aëration and purity of the blood, and through these the complete activity of the remotest organ. Upon the integrity of the epithelium of the respiratory passages depends in great measure the defense of the organism against the onslaughts of many microbic poisons.

The nose and nasopharynx must be kept free of irritations and pathologic changes, which might limit function or obstruct the in-and-out-go of the air. Upon the competence of the lung-expansion will depend the completeness of oxygenation and the competence of especially those portions of the lung which are less liable to a full distention, as the apices, so rarely developed and so vulnerable, and also the lower borders. The development of the lungs, of course, is more

commonly obtained through normal activities, but if for any reason these are impaired,—as, for instance, lameness, an enfeebled or damaged heart, or a weak, nervous organization,—and the child be not able, or it may be unwilling, or, at least, indisposed to wholesome action and exercises, then it is essential not to lose sight of the necessity of getting these lungs sufficiently dilated by regulated exercises for their proper growth and the continuance of their integrity. For feeble children it is convenient to induce them to play at certain games which may involve deep respirations and forcible blowings. Indeed, one of the first accomplishments to teach a child is to blow its nose properly. Pretty much every child in America inherits or may develop a condition of nasopharyngeal catarrh. Among the Greeks it was considered a degradation to be obliged to blow the nose, and a most impolite thing to do; but the reason for that was their perfect health, and a large part of this was the magnificent attention their skins received throughout their earlier and later years.

All children will almost invariably acquire occasional catarrhs, and they should be early taught to free the nose of morbid or excessive secretions. The way to do this is to teach them to blow a long, steady blast, holding the handkerchief against one nostril the while, and then, holding the opposite nostril, to take a long inspiration, and then to blow steadily out of the other one. And then, if not free, to repeat this process on alternate sides, at least twice, but never explosively. Then the air comes and goes freely, as it should, to the lungs, suitably warmed and screened.

Hearing also needs attention in the same way. As is well known, those children who habitually hear good music have this sense-perception better developed. The sense of smell, while deserving of attention, is rather more likely to be over-developed to the point of squeamishness than to suffer any lack in this direction, seeing that in the evolution of the race the nose is of clearly less need than in the savage state.

In the matter of taste this merely need be alluded to. It warrants attention, but rather on esthetic than practical grounds.

Forms of Exercises and Outings.—Every element of excitement, not forgetting oversolicitous attention and forced amusements, should be deprecated and avoided until children acquire genuine vigor. Excitable children need to be watched with the utmost care,

and the element of strain wherever detected should be sedulously removed. For very young babies merely keeping them in the open air is of great value. They should be sufficiently clothed, but not suffocated. The rule should be just enough and of the right kind, but not one bit too much; reserve overclothing to be near at hand always. In bitter cold weather veils are of great importance, always of sufficiently open mesh for the air to get readily through, but to protect from the rougher winds. This veil, upon occasion, may be doubled, and had better be of dark color and natural tint. For the poor, a piece of cheese-cloth will suffice. Veils should be washed or at least cleansed frequently, as a great deal of objectionable matter, both from the expired air and from floating dust, may accumulate upon them and be inbreathed again.

There is a prejudice against a baby or a child sleeping in the open air. If, however, it be sufficiently wrapped up no harm can result. During sleep relaxation occurs, especially with children of tender, leaky skins, and surface chills may arise, but this need not be if precautions are used. A valuable form of exercise and an adequate outing is had from allowing a little child from three to five years old to play about in a room with the windows wide open, and with its usual extra clothing on, such as is worn when taking its ordinary walks abroad. This form of outing can be enjoyed anywhere, at any time, for any given length of time, and the perfection with which it may be controlled is of the greatest advantage. Furthermore, by these means the caretaker watching may remain with the child and utilize the time by pursuing some employment in useful fashion the while. An apathetic little one, who without constant urging will quietly sit down and do nothing, may be kept busy or amused; and, *per contra*, a rushing, bustling little one, who would readily overdo, may be thus held in check.

Children of weak lungs or insufficient lung-expansion or with a predisposition to phthisis may be taught regulated breathings to great advantage. Also, a useful measure is to institute for these some games, such as blowing through a tube, as shooting of peas through a tube at a mark,—a very practical means of increasing thoracic size and lung-power. An excellent indoor game is the old-fashioned bean-bag, at which the nurse can be a companion, and thus a perfect regulation can be established of the amount of energies employed. This bag of

beans may be tossed back and forth so many times, and at different distances, increasing it from day to day and week to week. It may be at increasing distances. Both hands may at first be used, and, by and by, as strength grows, the one hand or the other, not neglecting either. Both the right hand and the left may thus have their adequate employment, and even for stronger children this is of excellent utility.

The next step in this direction is the use of the medicine ball, which in our larger gymnasias has become quite the fashion. This so-called "medicine ball" is merely a sphere, made up of soft material, weighing from one to six or seven pounds, and covered with soft leather, the rough surface out. For little children it may be about the size of an orange, or preferably a little bigger, as being convenient to hold in two hands. This, passed or tossed from one to another, requires more skill than the bean-bag, and may be used in the same way that a foot-ball is thrown and caught, either with two hands or one hand, and soon a very large measure of skill is acquired and interest incited. When the regulation or prescribed amount of passing has been done, then it can be stopped for one or all the players. A watchful caretaker may learn this himself or herself, or act under specific instruction what to do and what not to do.

The most important element in all games is the incentive of competition, even if that competition be with one's own self. In all these exercises, which are devised for the purpose of keeping up a consistent interest, a much larger amount of activity may be used, and with less reactionary fatigue than with any form of exercise which fails of this, no matter how eagerly one may pursue it as a measure. The converse point is, however, that vivid interest may cause a weakly person to do too much, even where he is endeavoring to do something with skill in which he himself is the only competitor. When, however, the competition is with others, the element of excitement is added, which may become hurtful to those insufficiently strong. Of games, many of the larger competitive kinds are manifestly unfit for children not overly strong. Match games of foot-ball, or even base-ball, are out of the question. Milder competitions, as in shinny or rowing, are of doubtful value; but golf is a perfect game for the feeble and the strong, the young and the old of either sex.

The evidences of overexercise in children or in weakly persons generally must be carefully noted. Mere breathlessness is no objection,

and is easily recovered from if the organs be sound. Also, a pretty free sweating is harmless enough unless this goes to the point of saturating the underclothes, exposing one to secondary chill. If, however, with very small exertion sweating comes readily, and, instead of being accompanied by a normal reddening of the surface and the face, the person becomes pallid or bluish and loses the normal luster or brightness of the eye, then caution must be observed. If after small exertion is seen a sort of trembling of the limbs, of the face and lips, this means that enough has then been done, and possibly too much. If seen habitually in the same individual the amount of exercise must be limited until by slow degrees and other means adequate strength is acquired. More soreness in the muscles afterward is of no gravity, though often a source of anxiety.

It is a good point to note the face, whether it be ruddy, pallid, or bluish, as an indication of benefit or harm from exercise; not that it is infallible, because some powerful athletes, men of greatest endurance, become pale while in action. This is, however, unusual. The pulse is a useful indicator, too, and while, of course, even the most vigorous people who are in moderate condition have their heart-action immensely accelerated under sustained exertion, nevertheless this usually marks the limit of their capacity, and must not be kept up too long, as under excitement, and if the person be in good condition he is likely to have a full, strong pulse, only a little quickened over his ordinary rate.

We have repeatedly examined the pulse and heart of boys under varying strains, such as a long foot-ball game or base-ball match, in which there was pretty constant action, and have noted that the condition of the pulse in those otherwise in equal condition varied very much with their excitability. And, inasmuch as this excitability of the person reflected upon the pulse means rapid using up of pabulum and rapid oxidization, therefore it is fair to assume that the rapidity of the pulse is a good indication of the using up of vigor. If the strain on the heart is too severe, the result will be a proportionate exhaustion. The tissues of young folk are so clean and elastic that an excess of intravascular pressure can do less harm than in the adults. The heart not only needs to be of proper size, shape, and tissue-competence to fit the body, but the tension in the arteries and the quality of its vein-supply may be ample or lacking; when this

is below par the heart acts slowly and laboriously, and is easily wearied and its force soon spent. This is shown in dyspnea and palpitation, "air hunger," "besoin de respirer"; if long continued, the result is cardiac asthma. This phenomenon is frequently observed in the healthy under customary exertion; it is then chiefly due to the normal phenomena of insufficient elimination of the products of tissue waste, and is comfortably met by a few minutes' deep breathing or ample oxygenation, and most economically lying flat on the back, arms and legs outstretched, the head retracted and mouth open.

For children younger or older the very best form of outing is to potter about a large garden, doing a little here and there and then resting awhile. The acts involved in gardening, the digging and pruning and various forms of activity essential thereto, are far and away the healthiest forms of exertion known to man. Indeed, the age of gardeners is unusually prolonged, provided they live wholesomely conditioned lives otherwise. Farmwork is a different matter, involving greater strains. But the work of the garden, under intelligent supervision (or advice which is followed), is suitable for young or old, and is of the largest possible utility.

For girls or feebler boys the cultivation of flowers in boxes, or window gardening, is a healthful occupation. The care of small animals or of fish, as of birds or small four-legged pets, the making and caring for aquaria and such like things, are excellent as sustaining interest and supplying some form of activity and variety without strain. The study of botany and field botanizing is among the best.

The study of birds in their natural haunts, watching their conduct, listening to and recording their songs, keeping the eyes upon their movements, especially with a field-glass, is of infinite interest. So, also, of the woodland moving things, not neglecting even ants and spiders, although using all due precautions in approaching the latter.

For older boys, even of the sickliest, provided they have the use of their limbs and reasonable integrity of their organs, there is no one form of life which so largely conduces to the building up of nervous force and muscular vigor as camping out in the woods. There is so much to be said on this subject, right sort of camp protection and varying conditions, that it is only possible to allude to it with the statement that our experience has been fairly large, admitting of an expression of opinion, though few rules can be formulated short of a long essay.

The life of a boy under, of course, proper control in the woods far away from civilization is as near as possible to perfection, to the vitalizing influences of aboriginal nature. He is freest there from all those minor and major disturbing influences, excitements, artificial restrictions on spontaneity which permits of healthy growth, mental and physical, encourages symmetry and fortifies against warpings.

We have advised the liberty for a boy not ill but still far from strong, about whom it was most natural to be gravely apprehensive lest the experiment should fail or prove disastrous; nevertheless, without himself being at first particularly pleased with the experience, this camp-life succeeded in accomplishing what no other combinations had been able to do, even of the most carefully selected or expensive kinds. The irregularity of feeding, lack of sleeping comforts, the loss of various civilized necessities notwithstanding, were offset with immense effect by the simplicity of life; the element of independence of little things ordinarily provided and thought to be needful; the absolute naturalness of motions and attitudes, and things done; the early hours to bed and even earlier to rise; the constant breathing of perfect air, whether of night or day, wet or dry, it mattered not, and many other points too numerous to mention produced a result most satisfactory. When in doubt it is always well to hopefully and fearlessly resort to such conditions.

Morals and religion in these surroundings need little teaching,—a hint will suffice, and this, to the narrowed mental horizon of a young person, is a vastly important point,—and nowhere better than in the woods or wilds. Confusion is usually produced in the concepts by special or didactic ethic teaching, and it is a much worse thing than ignorance which is a clear field for the intuitional understanding.

Development of Muscles.—There is still an impression prevailing among even the best teachers of physical culture that development of the muscles exerts of itself a particularly valuable influence upon the general constitutional vigor. A good deal of attention is directed by writers on this subject and to various means of cultivating muscular power. This is true only to a very moderate extent. To be sure, the exercising of the muscles can scarcely be carried on independently of certain collateral coördinative acts involving the healthy energizing of the vital organs. By quickening their activity by that of the circulation and stimulating the ebb and flow of the blood

throughout the motor mechanism, this does improve nutrition, and, to a certain degree, enhances generally the vigor and power of the whole economy. Exercising the muscles in vigorous persons with sound and competent organs adds to the usefulness of the trunk and limbs, enlarges their capacities, and is of permanent value. In the class of cases under discussion this is also true, but with many important modifications. The heart may be thus hypertrophied or weak spots unduly strained.

Let us review for a moment the different kinds of muscular actions, their mechanism and physiology. There are the voluntary and the involuntary muscles; ordinarily only the former are considered under the subject of exercise. The effect upon the involuntary muscles is a very important one, however, and precedes and should proceed *pari passu* with the stimulation of the voluntary mechanism. It is conceivable—and, indeed, we have seen instances which illustrated this—where individuals have acquired a species of muscular monstrosity by having their voluntary muscles so exercised as to increase their size and power out of all proportion to the organic capacity of the individual. This produces an overgrowth of a kind which is not only almost valueless but a distinct menace and an evil example. In the exercise of the limbs we may divide the kinds of energy into those of swiftness or speed and of power, which may be again divided into the combination of both swiftness and power. In acts of muscular swiftness we have a very intimate connection between the motor center and the muscular mechanism in which the center is more exercised than the limbs in proportion as we try to produce accuracy of movement with suddenness. In any muscular action involving mere power, as, for example, lifting a dead-weight, there is very little effect produced upon the motor center, but the strain is directly upon the muscle used, collateral muscles acting with this, the tendons and framework, and particularly the heart and peripheral vessels. In acts which involve both force and swiftness along with accuracy, there is a large complexity in the physiologic act and a most widespread strain is thus placed upon the mechanism, as, for instance, rowing a boat as rapidly and as long as possible. There is, again, another form of muscular action which involves a very considerable strain, but which is too often overlooked, and that is the passive physical tension illustrated by the perfectly strained muscular equipoise of a cat lying in wait for a mouse, in

which almost every muscle of the body is used, including the controlling nervous mechanism in the brain, which here is in a form of concentrated attention (expectant attention). This latent energy produces very considerable fatigue, and directly in proportion to the degree of excitement and concentration of attention. It is familiar to all, and most of us can appreciate how fatiguing it is to stand for a long time, or to hold on to an object, as even a baby in the arms, the tiller of a boat, or the reins while driving a horse. The strain is doubled by an excitement which may again be emotionally exaggerated to the hypersensitive or overconscientious person in the performance or continuance of an act. It is not so familiar, perhaps, but equally important to realize and prevent that sort of fatigue which is liable to occur in those who must remain quiet, but who excite themselves by subjectively aiding in carrying out conspicuous acts of another in their minds while watching them. For instance, an excitable person looking at a match game of foot-ball, influenced by eagerness for the success of one side, involuntarily puts forth an immense degree of energy by his desire to help along the others. Indeed, we have known of invalids who, while watching such contests where one of their own family was contending, became seriously exhausted by just this sort of passive strain or expectant attention.

There is a distinct physiologic relief produced by the active forms of exercise which result in temporary breathlessness when followed by periods of rest. Physical and mental tension is lowered by profuse sweating; excitement is relieved to a great extent by a normal or customary overaccumulation of carbon dioxid, which is itself a sedative.

It is well to bear in mind that for children intrinsically weak, both in their muscles and in their nervous force, and whose organs are also below the average power of their other parts, muscular exercise must be hedged about with many safeguards and thoughtful modifications. It is doubtful whether such children should be given much special exercise for their muscles alone, such as by pulley-weights, dumb-bells, and gymnastic efforts, unless these be of the lightest and in combination with other things, while it is equally important that they should not be allowed too large a scope for exercises of a complex nature. Deliberate and continued acts, of which carpentering and gardening are familiar types, are the best. Indeed, the use of tools, involving as

it does interest to the mind, is second to none in value for young or old, weak or strong. Complex exercises, involving both force and swiftness, should be gradually worked up to. The most perfect form of gradual approach is in the form of regulated exercises devised by the Swedes, wherein the muscular acts are reduced to their fundamental principles in force and direction; and in the hands of a skillful operator a person is led step by step from the simplest acts to the most complex and forceful ones, and during this process the organs also grow accustomed to the gradual strain. When the individual is vigorous enough to perform little acts of skill, incentive is thereby added and the muscular work is better endured. By and by minor competitions have their place, and so long as these are held in due restraint all is well, and great benefit results from a judicious continuance. If incentive becomes insidiously merged into excitement, then a peril threatens. Exciting competitions are only for the strong; innocent incentive in the form of music during muscular exercises is often added with advantage. This is particularly illustrated in the exercises of the German Turn-Verein and Turn-Gemeinde.

Dancing is a most wholesome exercise, if only it be not superadded to, or grow into, undue excitement. "Fancy dancing" for girls is of special value, graduated, of course, as it brings out the graces as well as strengthens the muscles, teaches equipoise, and especially benefits the loins and back, the weakest place, and usually the most undeveloped part in females.

Development of the Nervous System.—The development of the nervous system has points of similarity to the growth of a bank account, is subject to somewhat the same variations; at times inadequate, again fairly sufficient, on extreme occasions running so low as to come to the verge of being overdrawn, but under no circumstances can it be excessive for the requirements of the child, if the growing needs are kept in mind. Nervous force grows most satisfactorily by slow and economic degrees; excitements of all sorts are perilous, inducing a waste in one way or another, and only robust natures accumulate enough to squander, lest, peradventure, the account be suddenly overdrawn and bankruptcy ensue. It is popularly admitted that the world is swayed by vigorous nerve force. Language is replete with terms making nervous energy synonymous with courage, endurance, wisdom,

and all those factors, in short, which are embodied in the term "success." It is alone the lack of nervous force which sometimes makes inefficient an otherwise sound bodily organism. On the other hand, a feeble construction, endowed with vigorous nervous force and energy, constitutes an efficient engine. An adequate accumulation of energy in the nerve-cells and centers is the very fountain and main-spring of a wholesome life. As we possess little or much of this are we useful or negative beings; whether our actions are mainly mental or physical, it is the same. When this energy is exhausted or run down, it must be wound up again, but, unlike the clock, it requires a long period of time in accomplishment. Moreover, during this time all the vital organs tend to deteriorate structurally while this controlling force is withdrawn. To acquire nervous vigor its growth should suffer few and small interruptions. We see among country folk, laboring men, and savages, natures which are relatively little disturbed by protracted drains on their vitality, especially of the kind which induces physiologic irritability in more complex beings, and this is due largely to their slow growth and simplicity of life, slowly storing up cellular energy. Such folk become not only well filled with force, but tenacious of it and well balanced. If their store be suddenly or excessively drawn upon they can well sustain the tax. Children whose lives are one long monotony may not be so bright and alluring as some others, but are far more stable, better able to labor and endure. Their observation is simpler and slower, but their concepts and inferences are apt to be clearer. This storing up of vital energy should begin before birth. The about-to-be mother should sacrifice something to enable her to live quietly and healthfully. A vast deal of harm would be avoided, as well as trouble to the mother and anxieties for her child, if this prenatal period could be spent under natural and wholesome conditions. We have scarcely begun to know much about maternal impressions, but they are of deeper influence and significance than can yet be explained. Hurtful impressions are thus transmitted beyond a doubt, and beneficent ones even more truly and constantly. It is conceded that the finest known specimens of children are found among the British nobility, and, as has been said elsewhere in this volume, our insular cousins are more enduring than we, certainly in physical competitions, as in long-dis-

tance running. The conditions of their early growth and development are hedged about with unusually wise safeguards. If, as has been objected by sentimental observers, these children see less of their parents than those of humbler folk, they are provided with the best possible substitutes in the way of caretakers and teachers. They are reared under the most perfect conditions as to surroundings, almost altogether in country places; whereas those children compelled to live with their parents—who, having a good many demands upon them, are unable to devote their best energies to the care and instruction of their offspring—are liable to grow up hap-hazard, and fall into many dangers, in spite of the best affection and intentions. Indeed, there is a manifest peril for a child to be provided with too much or too solicitous affection from unwise parents, and, although home influences are inestimable in the way of character growth, nevertheless the exigencies of modern life too often call away the best energies of the parents, and children come in for what is left.

A word may be said in passing of children who are backward mentally, a condition which frequently is only relative, being a state of instability of the nervous equilibrium, from which good or evil results may follow, depending upon the same conditions which help or prevent the growth of the nervous force in the body elsewhere. By far the most important considerations have to do with the acquirement of physical invigoration. If mental feebleness be once recognized, it is beyond measure important for the parents to seek skillful advice and to follow it closely. The education of the mind and of the body should go hand in hand, and all forced forms of mental training should be avoided. If the parent is able and willing to be the caretaker, and spend a good deal of time in the open air, especially the fields and barnyard, thus insidiously teaching and molding both mind and body, sharpening observation, and aiding in the formation of clear mental concepts, immense good can be accomplished, and, not seldom, the prevention of serious mental warping.

Development of Mind.—It is important that a few remarks be made on the development of mind as tending to show the connection which the brain and its processes have with enfeebled bodies. We occasionally see precocious minds endowed with very feeble envelopes. If such brains are overencouraged they are capable of using up too readily what little residual vigor there is in the entire organism.

Precocity is a manifest peril; * it is ever of doubtful value; the very abnormality is evidence which should put us on our guard so that we should aid in preserving not only the organic activities and groundwork, but, above all, the integrity of the mind itself. Other things being equal, the mind should receive little or no special attention until the rest of the organism is fairly well repaired and put in working-order. Actual instruction had better be delayed, and the teaching should always begin with the simplest possible object lessons; suggestions such as emanate from well-conditioned, wholesome-minded folk should surround the child, even then keeping very close to simple, uncomplicated truths and their practical application. The method of teaching as outlined by that wise and good man Froebel is the healthiest both for the weak and the strong, and no system has ever been devised which approaches it in wholesomeness, certainly for very young children. Along with physical weakness there is inevitably a certain lack of mental vigor, and this must be particularly borne in mind, no matter how intelligent or bright a child may seem to its admiring parents or worshipping relatives. Mental processes are purely the outcome of physical activities, and there are in history conspicuous instances of great intelligence, and possibly wisdom, pointed out as existing in wretchedly undeveloped bodies; yet such are always open to question, and in the ordinary course of every-day life we certainly can not assume that this unnatural juxtaposition is probable. Therefore it must be assumed from the outset that in a feeble body the mind must be handled with unusual delicacy and judgment to enable it to develop according to its possibilities, no matter how highly or hopefully we estimate these. At least the regularity of the organic activities must be fairly good to enable an organ of such astounding delicacy as the brain to grow naturally in size and power, and there must be maintained a very high order of cellular integrity to enable that organ to

* Precocity is a loss of balance between the bodily and mental growth of children in which one or the other element may predominate, but rarely both appear together. This state is scarcely one for parental gratulation, and always demands exceptional care to check on the exuberant hand and develop on the lacking side. It is seldom or never accompanied by intellectual balance. Sustained action, mental or physical, is unusual also, and in many ways such children are disturbing factors to their families and themselves, and usually come to ultimate grief. They need isolation and systematic physical development of a slow and quiet kind.

reach even a fair degree of energizing capacity and delicate differentiation. If this be true of early budding infancy, when the whole organism is largely that of a vegetable, and until the time of early adolescence, when the brain reaches its normal bulk, it is even more important that from thence on to the time of maturity, which is about the twenty-fifth year, every care be exercised to enable the natural perfection to be reached. When, then, instruction shall be admissible for a little one is a matter of much difficulty to decide just how much and of what sort this may be, depending, of course, upon the material with which one has to build. However, the ordinary method of teaching language, and dividing it up into letters and constructed words, leading from thence to the principles of language, and finally to abstract thought, clothed too often in almost incomprehensible phrase, is certainly far from wholesome for those of the weaker sort.

Simple inductive reasoning from natural objects, of their quality, habits, and means of growth, is the kind of thing that should be pursued. The average teacher knows pitifully little about what the mind of man in this budding state is capable of doing. We would urge upon all who have any desire to know the truth to begin by learning what the ordinary concepts of a young child are and how they shape themselves, and how language, as ordinarily learned by him, so misleading, is capable of conveying or distorting thought.

FEEBLENESS IN GIRLS ABOUT THE AGE OF PUBERTY.

Girls who become pallid and feeble about the time of puberty constitute a more or less constantly recurring group of cases, and present themselves with a series of symptoms indicating symmetric enfeeblement of mind and body, becoming lack-luster, losing interest in life, and are a source of considerable anxiety to their parents. Too often this group of symptoms escapes the attention it deserves; a medical adviser trying, perhaps, several methods to relieve and, failing, gives the time-serving advice to allow this child to outgrow the difficulty. Of course, if any organic disturbance is detected, if there be anything obviously amiss in the digestion or elsewhere, and these difficulties are removed, then in the removing of that which is obvious other disordered states are helped, and final recovery, partial or complete, may be the result.

So long as girls are in the vegetative stage with undeveloped sexual tendencies, while they romp and play as boys and girls should do, all goes well. The requirements of civilized society, consciously or unconsciously recognized, which limit the too boisterous play of girls, causing this to stop or offering discouragement, inducing an early oversqueamishness about getting themselves dirty, or making more noise than custom encourages, taking more interest in the refinements of life than the essentials, gradually produces in girls approaching puberty an exaggerated sense of the importance of refined conduct. This is by no means confined to the upper class, although, perhaps, more generally seen there.

Often very early the human female begins to suffer from slowly acting bowels; not only so, but unless the opportunity for evacuating these is hedged about with all kinds of artificial safeguards, any discouragement will result in neglect. Teachers in schools admit this, when differences between boys and girls in this particular are pointed out.

An examination of the girl who seems to have lost her interest in life will usually reveal loss of appetite or overparticularity in choosing of foods, often some vitiation of tastes, lack of muscular capacity, perhaps some evidence of dyspnea on exertion, irregular or slow-acting bowels or recognizable failure in circulatory activities, especially clammy hands and feet, heaviness of breath, and if the lungs be examined the apices are seen to be insufficiently expanded. The heart exhibits evidence of dilatation, or, at any rate, there is a flabbiness about it and a distance to its sounds, a heaving impulse, and the pulse becomes overreadily disturbed in rhythm upon motion or excitement.

The girl will be more inclined to read and employ herself in sedentary fashion, and will lack spontaneous activity and alertness. The blood, if examined, will be found defective in hemoglobin; the urine perhaps of the highest specific gravity, probably alkaline, or it may be considerably increased in amount, or these conditions may alternate. The symptoms are vague enough to escape attention ordinarily, but prompt and persistent remedies are here of almost as much importance as in more seriously disturbed states. If all this be neglected, the girl's character may sometimes be grievously altered and her future changed. She may be regarded, however, as merely quieting

down from her hobbledehoy stage, and many mothers will usually welcome this.

Remedial measures are most important lest worse things follow and should be persistently employed for months rather than weeks, continued, it may be, for years. Nothing is of more importance than that the physician shall gain the confidence of his patient and secure her coöperation. If she will be frank and candid discussing the matter with him, he will very often find much that would otherwise remain obscure. There are numerous psychic conditions which demand careful weighing,—the doubts, the fears or ambitions, more likely a hypercritical self-examination; at any rate, an increased introspection, and not seldom a rather interesting and original conception or expression of views on life which will amuse and instruct the investigator.

The chief difficulties and needs have to do with the question of supplying incentive, the devising how to secure an increased interest in life in its wholesomer aspects. Lack of incentive is the greatest stumbling-block in dealing with apathetic folk, whether children or adults, and here the personal factor, the force and individuality of the physician, comes in most strongly, and some men can infuse a greater degree of enthusiasm into their patients than others.

As to how we shall accomplish initial movements, an awakening of interest and invigoration of the will, few rules can be outlined or applied. It is a good plan, however, to strive earnestly to impress, not only the necessity of doing as we direct, but to urge this with such subtlety and tact, and, withal, extreme persistence and variety in our methods, that the result may be surely obtained soon or late. Flattery is an important agent, stirring the vanity which every one possesses, or should possess, and it is perhaps nowhere more influential than in dealing with girls, for the keynote of success lies here. Of course, it is impossible to expect much success in shaping or directing forces until there is enough of inherent vigor present to warrant activities, whether of the mind or body.

The first organ to be looked to is the heart, not neglecting, of course, the digestive conditions. A powerful heart-tonic used for a few days or weeks will help more than any other one medicine, and it is our custom to add to any tonic used digitalis (digitalin) or strophanthus or nux vomica in full doses. So soon as we can secure a full, regular,

strong pulse, and one which is not subject to more than the normal variations from lying, sitting, or standing, and swift movements, we have the most important physical point gained. The amount and character of the animation is a fair indication of the usefulness of our heart-tonics; the urination is also a helpful index, and these should be reduced to uniformly demonstrable measures.

The digestion requires assistance, and the predigesting agents, such as pepsin or pancreatin in elixir, are not only of value but good menstrua for other drugs. The bowels must be kept sufficiently active. The food should be supplied in adequate amount, using exact measurements, and had better be highly albuminous, at least for a while. There is usually little appetite for meat, and often revolt at milk. Regulated amounts of broiled or scraped beef or mutton, along with predigested milk or koumiss, will soon show results. Along with the digestive tonic it is well to use mineral acids, muriatic or, preferably, nitromuriatic, especially where the urine is found to be alkaline,—a very common cause of mental depression. Most cases of anemias in this class, as well as in younger children, are due to faults in the intestinal digestion, and important medicines, aside from those alluded to, are forms of myrrh, such as aloes and myrrh, and the intestinal antiseptics, salol, β -naphthol, and bismuth; and the use sometimes of castor oil, either once or twice a week at first, to secure thorough evacuation, or in smaller amount in capsule three times a day, immediately before meals, in ten- to twenty-minim doses is very helpful in catarrhal states.

Many girls get into the luxurious habit of sponging themselves by piecemeal, in dribblets of lukewarm water, or taking a warm or hot bath, which they declare is a great comfort and pleasure. It is, of course, not wise to insist on a cold bath at once, especially where menstruation is irregular, but this can be accomplished by the help of a competent trained assistant or a good nurse or maid. The use of cold-water sponging or bathing should be learned and practised. A good way to begin is: The patient standing in about three inches of warm water, get a maid to sponge her off in a little of this, immediately following with a larger sponge, rapidly going over her with cool salt water, growing colder each day until it is quite as cold as the room in which she stands, or more so, immediately followed by a brisk rub down, until the skin acquires a prompt reaction, and there comes a

clear pink color from head to heel. This bath, moreover, is better given after a partial breakfast, such as a cup of cocoa, followed by rest in bed for half an hour, then the bath given by the maid, a rough rub down, and finally breakfast. As the girl grows stronger she will take her cold bath herself and learn to enjoy it. It is valuable also, after some regular outing or exercise, to take another salt sponging, not so thorough, perhaps, and a rest, lying down from half to an hour, say, until the end of the afternoon and until the evening meal is ready.

The kind of exercise suitable to such cases is too large a subject to discuss in full. One thing is manifest: the habitual inaction reacts upon the heart, increasing its feebleness, from whatsoever cause that may have come. A slowly and carefully increased exercise, not too monotonous, along with vigorous tonic medication, will repair the fountain of motor force.

The lungs will usually be found insufficiently expanded, at the apex especially, and respiratory gymnastics are indicated if some one can be found to properly direct them, and this the physician himself should supervise. Forced deep breathing twice or thrice a day will accomplish needed expansion and greatly aid in oxygenating the blood. The use of medicated inhalations is helpful, but to blow upon a horn or the use of a boy's pea-shooter would be equally good, and whatever agencies will produce a deep respiratory action. At first the patient will complain that it makes her dizzy, and, being more or less apprehensive about her physical state, she will object. So soon as she can be induced to take mild, open-air exercise, by which walking solemnly along the street is emphatically not the best, and not even a good way, she had best be encouraged to do so. The so-called calisthenic exercises, which mean "beautiful forcefulness," probably because they are usually so hideous, are devoid of interest and not particularly useful. Only that exercise is best which involves some pleased acquiescence in the performer or some interest in the doing. Fancy dancing, as remarked above, admirably develops loins and back.

Tennis is also very well but too violent for girls below par, and certainly until the patient gets into a moderately good condition. Golf is one of the best possible exercises and is to be highly and persistently recommended. It can be played at any time, for any

length of time, alone or in company. A giant can play even with a dwarf by handicapping. The bicycle has the very profound merit of being acceptable to most persons, at least nowadays, while it is so fashionable; it may not be the best thing to use, but it is certainly best to use something that is not harmful, and in most cases this fills a very obvious need. The bicycle is monotonous and the character of movements is restricted by the rotary mechanism, hence develops unsymmetrically and may exhaust before it tires the muscles. Cycling is a peril because of the competition of companions who lure the weak quite too far. Girls should not push up steep hills and never attempt to keep pace with powerful young men. Strain on the eye gives headaches; constant unremitting balance also fatigues; both together cause megrim headache. Swimming at the seashore or elsewhere is of admirable efficacy. Rowing gently in a skiff; the old-fashioned game of croquet, most unfortunately now out of fashion; the excellent and ancient game of graces, which really were more or less graceful; and that obsolete practice known as battledore and shuttlecock, all have merit. For those who can afford it, or in whom it is warranted, it is certainly best to prescribe and supervise a course of massage and regulated exercises in the form of Swedish movements; but the discussion here has rather to do with cases who do not care to be considered invalids, yet none the less require the full attention of physician and parent.

Girls who go to school are the victims in these days of vaguely defined forms of exercise called "physical culture," usually demonstrated by one of the least busy of the teachers, who tells them to stand up and wave their arms to a one, two, three order, and the uninterested girls present, under these circumstances, a most listless imbecile expression. But this is better than nothing—better by far than sitting all day stagnating, and may serve a more or less useful turn. If, however, the time so used were employed in tossing back and forth a good old-fashioned bean-bag from one to another, or that most useful of exercises, the medicine ball, causing it to make the circuit of the room, and omitting no one; perhaps keeping two or three going, giving eye and hand and brain all an opportunity of acting together, and involving, as it does, some little amusement of a competitive kind, and requiring some personal skill, would be the best employment for the short recess in the ordinary girls' school. When the weather

admits of it, the best thing to do would be to don overshoes and warm head-gear, a pair of old gloves, and toss this medicine ball about out-of-doors. But if this be objectionable to the oversqueamish teacher or parent, let the windows be opened wide and the girls kept at exercise for ten minutes pretty actively; they would thus get a mouthful of clean air and a stirring up of the blood and absolutely no danger of "catching cold." It is, indeed, one of the most difficult problems to first select and next to carry out the proper means of developing the bodies of our growing girls. The subject is woefully neglected, although there are a good many fashionable attempts made, and the results are, in a measure, satisfactorily growing. There is much to be said in favor of the so-called relaxing exercises, when skillfully taught by one who can elicit some interested coöperation, accompanied, it may be, by music, and supplemented by posings and graceful, rhythmic stretchings and deep, regulated breathings. Class work is of value as sustaining interest and attention. The best teaching is in private by a mistress of the art, who will judiciously increase and vary the movements in accordance with individual needs.

One word should be said just here about the various disturbances of regular menstruation when once established. These are very rarely due to any malposition of the uterus. The colicky pains, backaches, nausea, etc., are seldom more than the outcome of incomplete or irregular development in the uterine tissues or the local circulatory supply, or the nervous distribution, all of which may be slow to adjust themselves to new and complex conditions. Most disturbances of the organs of generation in women, as the wiser gynecologists admit, are sequences of coition and pregnancies, partial or complete, or specific infection, or both—neoplasms excepted. Pelvic examinations can be predicted to be negative, and should only be practised when all other rational measures fail. These consist of due attention to the whole organism and systematization of special hygienic measures as already outlined. But let it not be forgotten that once the attention of a neurotic girl be directed to her pelvic organs, her mind becomes infected with a germ of disease which may, and too often does, warp her life and that of all those in her immediate environment.

CHAPTER XX.

DISEASES AND ACCIDENTS REQUIRING SURGICAL PROCEDURES.

TRACHEOTOMY.

This classical operation for the relief of laryngeal stenosis has been slowly superseded by that of intubation, and since the advent of anti-toxin it has been all but abandoned. It will be sufficient to briefly enumerate the conditions which may necessitate this operation.

For the removal of all foreign bodies in the larynx or trachea the operation obtains a large measure of importance, but in the treatment of laryngeal diphtheria the indications for tracheotomy are as follows :

1. In those accidental cases in which the membranes have been forced down the larynx by attempts at intubation.
2. In those cases where the membranes are too extensive and are not to be reached or relieved by the intubation tubes.
3. In those cases previously intubated where there has been a continuous formation of membranes reaching below the tube.
4. In those cases where the membranes have become loosened in the larynx, and where the choice lies between intubation and tracheotomy, the latter is free from danger, for by the introduction of a tube the membranes may be forced down still farther into the larynx, causing asphyxia and then necessitating prompt tracheotomy.

The papers by Dillon Brown, John Bokai, and Edwin Rosenthal, analyzing different groups of cases tracheotomized and intubated, have led to but the one opinion—that in diphtheria intubation is the preferable operation, and, excepting those accidental cases which are mentioned above, and for which no expedient has been devised, tracheotomy may become an obsolete procedure.

INTUBATION OF THE LARYNX.

Laryngeal intubation is universally recognized as a life-saving operation consisting of the introduction of a tube through the mouth into the larynx for the relief of laryngeal stenosis.

To Joseph O'Dwyer, of New York, belongs the honor of its creation.

O'Dwyer's instruments consist of a set of six tubes, with a like number of obturators, an introducer, an extractor, a mouth-gag, and a gauge.

The tubes are so shaped that they approximately fit the larynx, being somewhat bulbous at their lower third, and are graded in size by the gauge indicating the ages of those for whom they are to be used. It is essential, however, to take into consideration the size of the child, as frequently a much larger or smaller tube may be required than indicated by the gauge, and thus some judgment should be exercised in the choice of the tube. It is also well to remember that in certain stages of the disease the parts may be so swollen or occluded by a deposit of pseudomembranes that the safety of the operation may require a much smaller tube than indicated by age scale, the regular tube being too large for the affected larynx, and accidents often arise by forcing the membranes down into the larynx, causing asphyxia.

Dillon Brown, New York, has devised an improvement to aid in the extraction of the tubes.

Instead of using the O'Dwyer extractor, he has a stiff-wire loop attached to the head of the tube, firmly fastened on either side, rising about $\frac{1}{8}$ of an inch and closely following the posterior edge of the head of the tube. The extractor consists of a simple hook fastened to the finger by a flexible metal ring. On feeling the tube, and pressing firmly downward and backward, it is almost impossible for the eye to avoid slipping between the finger and the hook, and on withdrawing the finger the tube must come with it.

Louis Fischer, New York, has devised a new introducer and tubes made of hard rubber, which is a modification of the O'Dwyer instruments, and have the following points to commend them :

1. The 'Tubes.—These are of six sizes and are supposed to be made from the O'Dwyer pattern.

(a) Being cheap, each and every child can receive a new tube,

which after being used can be destroyed. It is unwise to use a tube from a previous diphtheria case and insert it in a non-infectious case, and thus run the chance of infecting the patient.

(b) The tubes are constructed of hard rubber, and will not permit of the formation of the calcareous deposits such as are seen on the metallic tubes of O'Dwyer. To overcome the disadvantage of being too light in weight they are filled with metal; and to prevent their being coughed up, as frequently occurs with the metal tubes, the rubber tubes are corrugated, by which device they not only hold well but need not be so heavy as the metal tubes.

2. The Introducer.—This is designed without any screws to hold the tube. It has two projecting prongs which hold the tube while being introduced, and release it by means of a small hook which is easily controlled by the thumb while the tube is being inserted.

The main object in devising this introducer has been to do away entirely with the obturators, which have been a source of annoyance to the inexperienced as well as the experienced operator, by reason that frequently, when an instrument has been in use some time, the screw holding the obturators allows the tube to sway, and thus, unless all parts are perfect in the O'Dwyer set, the tube can only be introduced with difficulty. Frequently, also, the obturator may break off whilst performing intubation, and alarming accidents thus happen.

The procedures of introducing Fischer's modified tubes are the same as with the O'Dwyer tubes, using a gag, silk thread, and the same technic. But greater expedition, so necessary in extreme laryngeal stenosis, is gained. The characteristic breath-sounds of intubation are obtained long before the tube is pushed home.

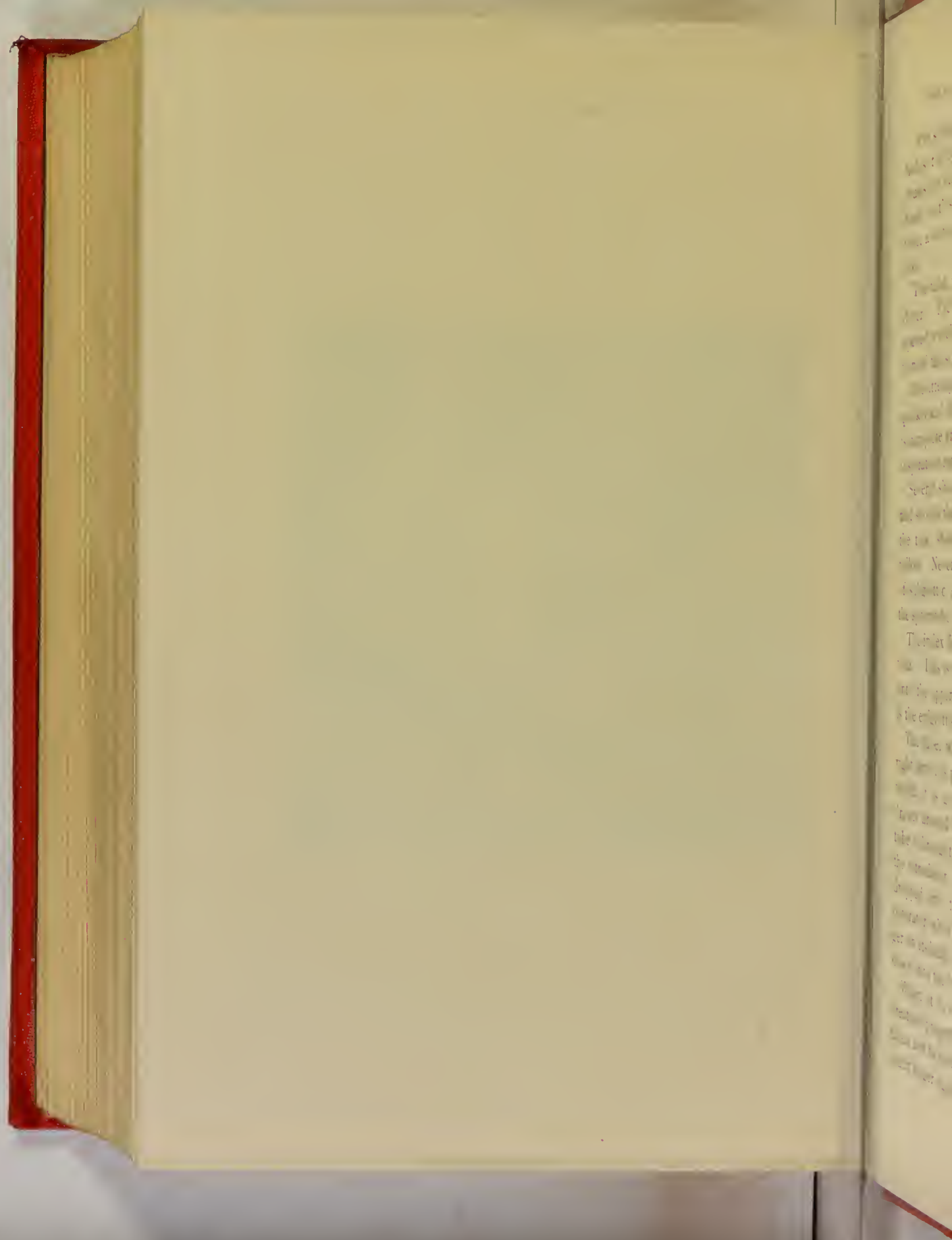
It is important, in using the O'Dwyer tubes, to have them thoroughly cleansed after each using, and, better, regilded, thus preventing any element of contagion.

Method of Introducing an Intubation Tube.—Two assistants are required, neither of whom need be skilled. The child, previously wrapped in a blanket or sheet with its arms to sides, is placed on the lap of the one assistant, in a sitting position, so that its legs are held firmly between the assistant's knees. The patient's arms are held firmly to its sides by the hands of the assistant or nurse in such a way as to steady the trunk, and in no way to interfere with the respiration of the child.



METHOD OF INTRODUCING THE O'DWYER TUBE IN INTUBATION.

Into Alveolar Tube. The alveolar tube is inserted into the alveolar space of the lung. It is a small, flexible tube that is inserted into the nostril and guided into the alveolar space. It is used for the purpose of administering oxygen or other gases directly to the alveoli. The alveolar tube is also used for the purpose of aspirating secretions from the alveoli. It is a very useful device in the treatment of respiratory diseases.



The second assistant stands behind the child, steadies the head, and holds it in correct position. The proper attitude is thus obtained: he draws the head up so that the child seems to hang from the top of its head; in this position only is it practicable to accurately introduce the tube, and this position should be firmly maintained during its insertion.

The tube, with the silk thread clear and free, is attached to the introducer. The gag is inserted into the left angle of the mouth, which is opened widely as possible, due care being observed to prevent laceration of the soft parts.

The attempt at introduction can now be made, and should be done quickly and during expiration (Rosenthal), for during the attempt there is complete arrest of respiration, and should membranes be dislodged inspiration may draw them farther down into the trachea or bronchi.

Several short attempts are always better than a single prolonged one, and should there be a cessation of respiration, or incomplete relief, the tube should be immediately withdrawn and a new attempt may follow. Never use force. Very little power is required except in cases of subglottic stenosis, where quite a little force is needed to overcome the spasmodic contraction (Dillon Brown and Rosenthal).

The index finger of the left hand is the guide in the act of introduction. This is passed far back into the pharynx, then brought forward until the upper border of the cricoid cartilage is felt; directly in front is the epiglottis, this being elevated by the tip of the finger.

The tube, with the silk thread looped over the little finger of the right hand, is passed along the palmar surface of the index finger, by which it is guided into the larynx; the handle of the introducer is drawn around so that it stands in the median line. In this way the tube is brought into the correct position, after which it is pushed off the introducer by the trigger attached to the handle, and is simply dropped into the larynx; or, the tube may be dislocated from the obturator while removing the latter, and steadied by placing the finger on its head, and after the removal of the introducer pressed gently down into the box of the larynx.

When it is certain that the tube is in position, and the patient breathes properly, the silk thread is cut and withdrawn, care being taken not to pull the tube along with it. This is done by placing the index finger again gently upon the head of the tube.

Should there be evidence of loosened membranes, or should the relief be not marked, or if there be any suspicion that the operation is incomplete, as when the tube is introduced into the esophagus, the silk thread should be allowed to remain, especially when prompt extubation is required. It is always well to allow the thread to remain at least twenty to thirty minutes or longer, until the operator is thoroughly satisfied of the completeness of the procedure.

That the tube is correctly placed is evidenced by the previously stridulous or rasping breathing giving way to a hissing breathing sound, followed by a paroxysm of coughing, excited by the irritation of the tube, and by the prompt relief of the dyspnea.

The coughing is an extremely good symptom, and is the most thorough and sure means of getting rid of the accumulating mucus and loosened membranes.

Before attempts at intubation and immediately thereafter, the throat is to be cleansed by a spray of peroxid of hydrogen applied by means of an atomizer. By its use the tube is enabled to glide into position, the froth engendered acting as a lubricant, and the danger of pushing down false membranes is greatly lessened. After intubation the peroxid excites coughing, and, in a measure, dissolves the accumulated mucus, enabling it to be more easily expelled.

The dangers of intubation are: The crowding down of the loosened membranes into the larynx, thus causing asphyxia and necessitating prompt tracheotomy; or the making of a false passage by using too much force and working at an angle of the mouth instead of keeping to the median line; or producing asphyxia by prolonged or injudicious attempts at introduction.

There are also dangers in performing extubation. The tube may be pushed down into the trachea by too firm a pressure upon the head of the tube by the extractor, or injuries to the soft tissues of the larynx by missing the opening of the tube and dilating the extracting forceps too widely and forcibly withdrawing. Their prevention is self-evident.

After-Treatment.—After intubation, as soon as practicable, give the patient something to drink,—water, milk, wine, as the case may need. Permit the child to hold the glass or cup and serve itself. Generally the drink causes coughing, and thus mucus and membranes are frequently brought away.

Vomiting very commonly follows intubation, the child by this means attempting to dislodge the tube, and in this it sometimes succeeds, thereby necessitating a repetition of the whole procedure. Care, therefore, must be used, and in the act of coughing or vomiting the child should not be allowed to lie upon its face; nor should it be held over the nurse's shoulder face downward, for in either position very slight exertion might cause it to expel the tube. After awhile the child becomes quiet, respiration assumes a more normal character, the pallid lips take on a healthy hue, relief becomes manifest, and a quiet sleep follows.

In cases complicated by grave pulmonary lesions the relief obtained by intubation is but transitory, but life can thus be prolonged so that judicious remedial agents can be administered.

As intubation is simply a means to relieve stenosis, the further treatment follows the same category as is pursued in treating diphtheria.

As is well known, bronchopneumonia is frequently a complication of the laryngeal variety of diphtheria; therefore the further treatment must be rather that of the preventive type. Again, intubated cases are more liable to heart-failure, and due care and foresight must be directed to this possibility. It is therefore well as a routine treatment to administer cardiac tonic remedies even if at the time there is no indication for their use. A very useful prescription to be given during intubation consists of tincture of digitalis, combined with strychnin and either the carbonate or aromatic spirit of ammonia, using the syrup of tolu as a vehicle.

While intubated cases frequently get along well enough in their ordinary surroundings, the air being moistened in the natural way before being inspired, it is often necessary to place the patient in a specially moistened atmosphere. An improvised tent can easily be rigged up in any household by means of an umbrella and one or two sheets. (See Plate, "Improvised Croup Tent.")

Steam can be led under this canopy from a croup-kettle or from any steam-kettle. Such a tent will be found very useful if complications exist or if the case be a long one, necessitating frequent and prolonged intubation.

Of far more difficulty is the administration of food, and here the ingenuity of the physician is frequently taxed. In the very young, where nothing but fluids are taken, this is overcome by having the

head, in the act of swallowing, placed lower than the body (Casselbury and Rosenthal).

This can also be tried in older children, where there is difficulty in swallowing in the sitting position.

Often food is refused in any shape and water is urgently demanded. It is safe to give any quantity, and where there is difficulty in swallowing this small pieces of ice are easily taken. Many children subsist for one or two days on nothing else but small pieces of ice. Frequently it is found that semi-solids are swallowed more easily than liquids; then can be given lady-fingers, corn-starch, wine-jelly, oat-meal gruel, scrambled eggs, and the like.

The entrance of food into the bronchi through the tube is a danger that does not exist, as has been conclusively proven by postmortem observations of Northrup, Holt, Rosenthal, and others.

External applications to the neck are often indicated, and, when required, are grateful to the patient; of these the cold pack, or ice poultice, stands first. Ice can be applied to the neck by means of an ice bag or a sausage casing. Sometimes warmth is more agreeable.

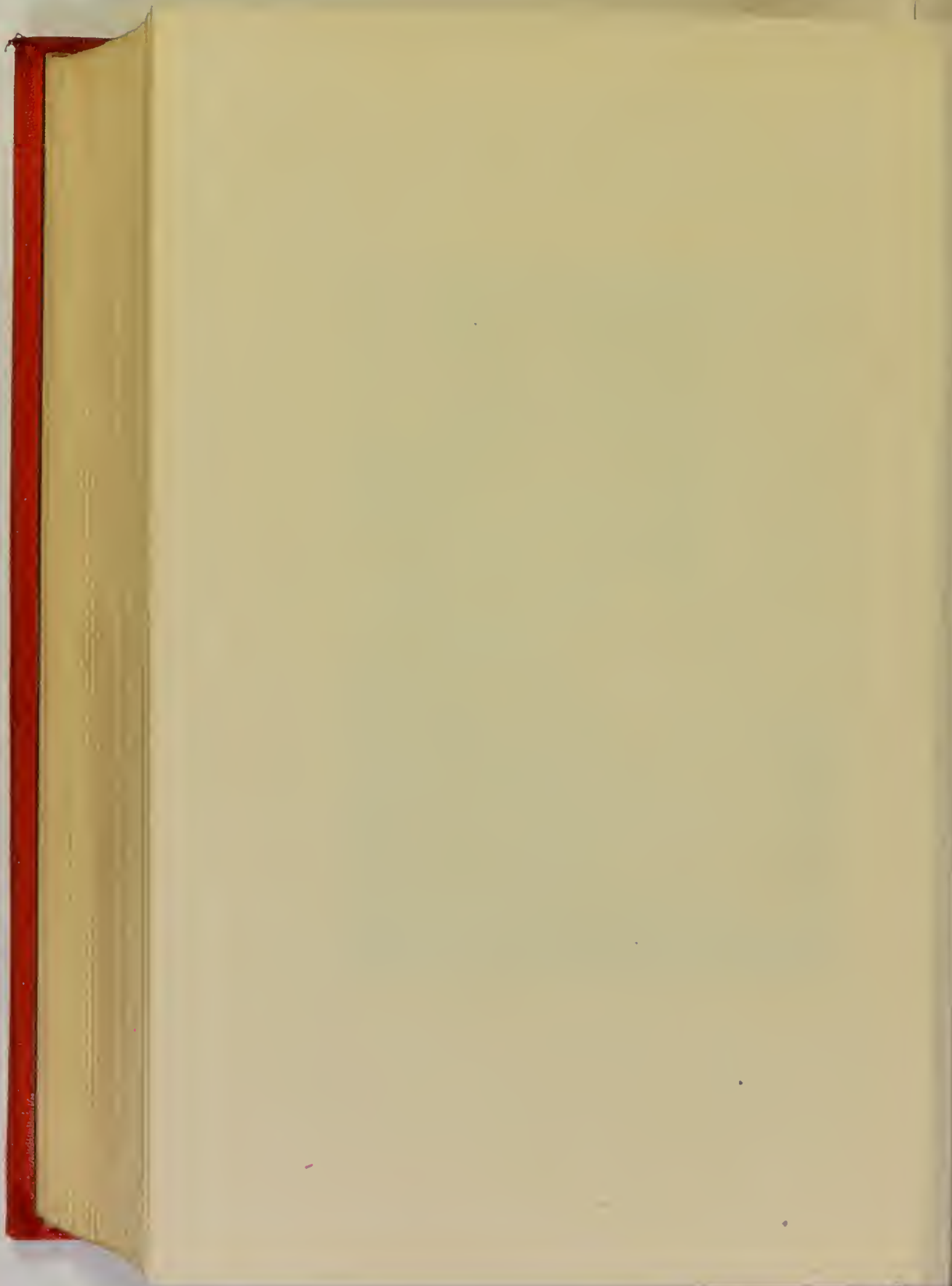
The indications for the operation of intubation are, in the main, the same as those for tracheotomy. The most pressing indication is the appearance of recession in those parts of the chest which yield to external air-pressure, with continued restlessness, due to insufficient oxygenation as well as feebleness of respiration. In cases of secondary involvement of the larynx, where the patient is more exhausted by reason of the toxemia that may coexist, intubation should be performed at once, even before the urgent symptoms of stenosis are manifest.

The advantages of intubation are:

1. The speed with which it can be performed.
2. Bloodlessness.
3. Absence of shock following.
4. It can be done any time—day or night.
5. No need of anesthesia or other preparations.
6. No wound is made, thus the spreading of infection is avoided.
7. There is no objection on the part of the parents.
8. The inspired air enters the lung naturally warmed and moistened.
9. The subsequent care does not require skilled attendants.



METHOD OF FEEDING CHILD AFTER INTUBATION.



Removal of the

When to Extub

Burns.—Some

The disadvantages are :

1. It clouds the prognosis.
2. Induces a tendency to heart-failure.
3. Its dangers: (*a*) pushing down false membranes ; (*b*) suffocation by finger or attempts to intubate.
4. Difficulty in nourishing patients.

Removal of the Tube.—This is more difficult than the act of intubation. The patient and assistants are arranged in precisely the same way as in the primary operation. The index finger of the left hand acts as guide for the extractor, the epiglottis is elevated, the point of the extractor enters the opening of the tube, the lever is pressed, the jaws are separated, and the tube is withdrawn in the same direction as it was inserted.

When to Extubate.—The advent of antitoxin has placed the length of intubation on a more definite basis. It is safe to assume that attempts at extubation should be made on the fourth or fifth day ; if the tube be withdrawn and stenosis relieved for from four to six hours, it is safe to conclude that intubation is no longer required. We should always be prepared to perform an immediate secondary intubation ; so another tube should be prepared ready at hand before extubating, if it is required. It is well to have the patient abstain from food for a few hours before extubation, and to give a stimulant immediately before the operation. After extubation further treatment of the patient will be required for two or three days, or until convalescence is firmly established.

INJURIES AND SHOCK.

Children bear injury badly, and in them shock is most marked. A slight loss of blood in a child frequently causes serious prostration, but the recovery is equally prompt and complete.

A description of the more serious injuries will be found in works upon general surgery and upon the special surgery of childhood, and it is therefore unnecessary to attempt to give a list or an account of them here.

Burns.—Burns from fire, acids, lime, and other corrosive substances, as well as scalds from hot water, tea, soup, or indeed whatever cause, are best treated at first by a strong solution of bicarbonate of soda, which is put on over the injured part which is then enveloped in

sterile absorbent cotton and placed at rest. If the destruction is more than superficial, ulcers will form which must be treated upon general antiseptic principles.

Children bear all forms of chemie antiseptics badly, and these frequently retard, if not entirely prevent, wounds from healing. Dry powders of a simple character, such as bismuth, oxid of zinc, and, if the area upon which treatment is to be directed is not large, iodoform, are better than many of the stronger germicides.

In the healing of burns and scalds, cicatricial contractions of the skin and deeper tissues are to be expected unless great care is exercised in keeping the limbs extended. Simple splints or weights and pulleys, if the contraction be of the lower extremities, will often prevent a very considerable amount of deformity. If, however, these simple measures are not efficient after thorough and persistent trial, skin-grafting, after the contracting bands are divided, should be used to close the wounds.

Shock.—The treatment of shock is to put the child at once to bed; surround it with hot-water bottles or hot-water bags, but be certain they do not burn the skin; give rectal injection of one or two ounces of black coffee and hot salt solution of a strength of $\frac{5}{1}$ to the pint, and small doses of strychnin hypodermatically. If no attempt at reaction follows this, and the injuries are not of such a character as to prohibit the child's being moved, a hot bath is of very great service. Drugs and stimulants given by the mouth, unless there be some effort at reaction, are of very little service, because with children, even more than with adults, the shock absolutely arrests digestion and absorption from the stomach, and there is danger of filling the stomach with stimulants which, when reaction does set in, will become suddenly absorbed and cause the patient to be overwhelmed by their accumulated action.

HARELIP—CLEFT PALATE.

Harelip may be single or double. It may involve simply the lip or be associated with cleft palate. Both are due to faulty development of the fetus.

Children with this deformity are usually unable to nurse, as the power of suction is lost, and require the greatest care in their management. The harelip must be operated upon early, a few weeks after

birth if possible, leaving to a later age, from three to six weeks, attempts to close the cleft palate.

The closure of the cleft palate is best done at two sittings, if the cleft be extensive. The first operation should be upon the hard palate; in a few months the cleft in the soft palate should be repaired.

It may be necessary to resort to the forced feeding of the child by means of a soft-rubber catheter and syringe. A specially constructed nipple with a shield to fit over the cleft in the palate sometimes answers in very young infants. These children are always of low vitality and, in spite of all efforts, may die very early.

DISEASES OF THE JOINTS.

Diseases of the joints are acute and chronic. The acute inflammations, synovitis and arthritis, are produced, first, by injury; second, by rheumatism; third, occurring in acute infectious processes, as in the case of scarlet fever and measles.

The acute arthritis of infants, which we see occasionally after the eruptive fevers, is an acute septic process with very rapid destruction of the joint and the surrounding tissues. The correct diagnosis of the character of the lesion is imperative, and active surgical interference is needed to drain the joint and prevent further destructive changes.

Inflamed conditions of the joint following injuries are treated on general surgical principles: by absolute rest and splint, with hot or cold applications; lead-water and laudanum, the time-honored remedy, being of comparatively little value.

In acute stages, ichthyol and lanolin, ten to twenty per cent., rubbed into the joint after the heat is applied, is frequently of great benefit. The most essential point, however, is rest. If the joint be very much distended either by blood or articular fluid, it may be well to aspirate, but only under the very strictest antiseptic precautions. The products of inflammation in the joint must be removed, or they will lead to the formation of adhesions and frequently destroy the usefulness of the joint.

By far the most common cause of joint disease in children, and, indeed, of diseases of the bone as well, is tuberculosis. The ankle, knee, hip, spine—in fact, all the articulations of the body—may be infected.

Tubercular diseases of the joints should be treated by conservative methods. Absolute rest in plaster-of-Paris, or some form of splint apparatus, and injections of iodoform and glycerin may be tried. The method of passive hyperemia as used in Germany, and which consists in constricting both above and below the joint with rubber bands, the restriction being only sufficient to cause venous engorgement without completely cutting off the venous circulation, may be tried. This will require care and watchfulness and a long interval of time, but the results, in many instances, are undoubtedly beneficial. When, however, the destructive process has advanced to such an extent that the joint is totally destroyed, and where the tubercular infection is very profound and the pain acute and persistent so that the child's bodily health is rapidly failing, arthrectomy, or excision of the joint, should be done.

Bear in mind that arthrectomy, or excision, will only give, at best, a mutilated limb, but it will often be demanded as a life-saving measure on account of the rapid progress of the disease.

Complications are abscesses which are not true abscesses from a bacteriologic standpoint; they are formed by the breaking down of tubercular deposits, and are called abscesses, though they do not contain the germs of suppuration; they are made up of cheesy masses of broken-down tissue which are loaded with tubercular bacilli. When such abscesses form, if after a reasonable time absorption has not occurred, they should be freely opened, so that the whole interior can be evacuated. The granulation tissue, which will be found covered with tubercular deposits, should be curetted first with a sharp spoon, and, second, with a dull spoon, or gauze and sponges may be used. All the time a constant flow of distilled water should be employed to wash out the wound, every particle of the material being scraped away. The wound is then to be closed, without drainage, after a small amount of iodoform has been dusted into it. This method of treatment, however, is only of use when the greatest care has been exercised to perfect the antiseptic technic, for if this is not the case the wound may become infected by pyogenic bacteria, a double infection will be present and much more serious results ensue than if the abscess be allowed to break of itself.

Many surgeons of wide experience in this class of cases totally oppose any surgical interference whatever, claiming that in a vast

majority of cases the ultimate result will be better if the opening occurs spontaneously and the discharge of the diseased tissues left to nature than if the abscess be artificially emptied, and that the danger of mixed infection is very greatly reduced ; also the resulting scar is less when the abscess is allowed to open spontaneously. This is totally opposed to our own personal experience, but it is the view held by a very large number of orthopedic surgeons.

White swelling, or tubercular arthritis of the knee, is one of the most common diseases of the joints in children. Next, hip-joint disease, ankle-joint disease, and Pott's disease of the spine, or spondylitis. In all these cases the most important element of treatment is absolute rest of the joint, at first by confinement to bed and the bed-frame ; next, by good food and good hygienic surroundings, fresh air, bright sunlight, and, lastly, by a perfectly fitting splint or brace.

INFECTIOUS OSTEITIS (OSTEOMYELITIS).

This is an acute inflammatory process of the bone due to infection by staphylococcus and streptococcus, which find entrance into the tissue either through a wound in the soft parts connecting with the bone or by absorption through the general circulation, and are deposited at some point where the vitality of the tissues is impaired, either by traumatism or disease. It frequently follows the eruptive fevers. The epiphyses of the long bones, and especially of the femur and tibia, are the most frequent seats of the disease, which soon extends to the shafts of the bone. It is so destructive in its consequences that the whole of the bone may be destroyed.

It is, therefore, necessary that an early diagnosis and prompt method of treatment be instituted. The **treatment** consists in freely opening the tissues down to the bone, trephining and chiseling the bone itself, and eliminating from the cavity the product of the infective disease. Many cases of so-called infective rheumatism in children are really those of osteomyelitis. The condition goes on for months and months ; the destruction of the bone is very extensive ; abscesses form and break spontaneously, and after a time the whole of the bone will be destroyed. If, however, in the early stages the disease be recognized

and promptly treated by a surgeon, many months of suffering will be saved and the limb be preserved with only a moderate amount of deformity.

The **symptoms** are those of intense septicemia, with high temperature, pain in the limb, swelling, and an acute abscess, which rapidly burrows.

OPHTHALMIA IN THE NEW-BORN.

By this term is usually meant a form of conjunctivitis occurring in new-born infants, produced in the majority of cases by infection from the vaginal secretion of the mother, who has previously been infected with gonorrhea. In mild or moderately severe cases the disease is limited to the eyelids, the conjunctiva or subconjunctival spaces, but where the infection is severe there may be ulceration of the cornea or even perforation of the anterior chamber of the eye.

Causes.—Mild cases of inflammation and swelling of the eyes may be produced by continued pressure during birth, or from the eyes of the child coming in contact with a vaginal discharge in cases where the mother has had a simple catarrhal vaginitis. Even a healthy lochial discharge may produce a slight inflammation. True ophthalmia is, however, in almost all instances, produced by the eyes of the child coming in direct contact, during labor, with a vaginal discharge which is either infected with the gonococcus or with ordinary pyogenic germs.

Uncleanliness on the part of the nurse, as, for instance, the dressing and care of an infant after attending the mother, who has been infected, may be a cause.

Symptoms.—The disease usually begins about the third day after birth, the first symptoms being redness and swelling of the lids, of the conjunctiva and subconjunctiva, immediately followed by a very free purulent discharge. The discharge is yellowish or greenish in color and may be blood-streaked; sometimes, indeed, there may be distinct hemorrhages from the lids. In a short time ulceration followed by sloughing takes place, and unless the disease yields to treatment a perforation into the anterior chamber of the eye usually follows. Where gonorrheal poisoning has been the cause loss of vision very often

results, unless the case is seen early and very energetic and careful treatment is used. Neglected cases frequently end not only in loss of sight but in systemic poisoning by pyemia.

Treatment.—The prophylaxis of ophthalmia in the new-born consists in first giving every woman affected with any form of purulent vaginitis or endometritis an antiseptic douche during the first stage of labor. The vagina should be thoroughly flushed out with a 1 : 2000 or even 1 : 1000 solution of bichlorid of mercury, or a hot solution of creolin and tincture of green soap, equal parts, in the strength of one dram to the quart. This should be given through a speculum, care being taken that all the folds of the vagina be stretched and the whole birth-canal thoroughly swabbed out by means of wads of cotton in a pair of uterine dressing-forceps. The next step in the preventive treatment consists in dropping into the infant's eyes, immediately after birth, a two-per-cent. solution of nitrate of silver, which should be followed by a drop or two of salt solution in order to neutralize any excess of the nitrate of silver. In some cases a thorough cleansing of the eye with a saturated solution of boric acid does well. In patients affected with purulent discharge it is often better to instill in each of the eyes a drop or two of a 1 : 5000 or 1 : 10,000 solution of bichlorid of mercury. Where the eye has become infected the treatment must be energetic and each step accurately carried out. The strictest antiseptic precautions must be used to prevent the infection from spreading to the other eye where only one is affected, and also to keep the disease from attacking those who attend the patient, or, in hospitals, spreading to other inmates. All cases of ophthalmia neonatorum should be isolated, and in hospitals it is absolutely necessary that one nurse be set apart to attend those patients only.

The treatment consists first in cleansing the eye every twenty or thirty minutes, night and day. This should be done by instilling into the eye a 1 : 5000 solution of bichlorid of mercury, by means of the ordinary grooved eye-dropper, or, as recommended by Holt, a dropper with a bulbous tip. Care should be taken that the fluid is introduced well into both angles of the eye, and with some force, so as to thoroughly empty the region of pus. In order to reduce the inflammation there should be constantly applied to the eye small pieces of lint or absorbent cotton, compresses, in fact, which have been rendered

cold by letting them lie on a cake of ice. These should be applied every minute, at least, and this treatment should be kept up as long as the inflammation continues. It has been recommended that a few drops of a one-per-cent. solution of nitrate of silver should be instilled into the eye. Where the cornea becomes involved the pupils should be dilated with atropin. It is of the utmost importance that all dressings, etc., coming from the patient, should be burned as soon as removed, and the nurse must take the greatest possible care in washing and antisepticizing her hands both before and after attending the case.

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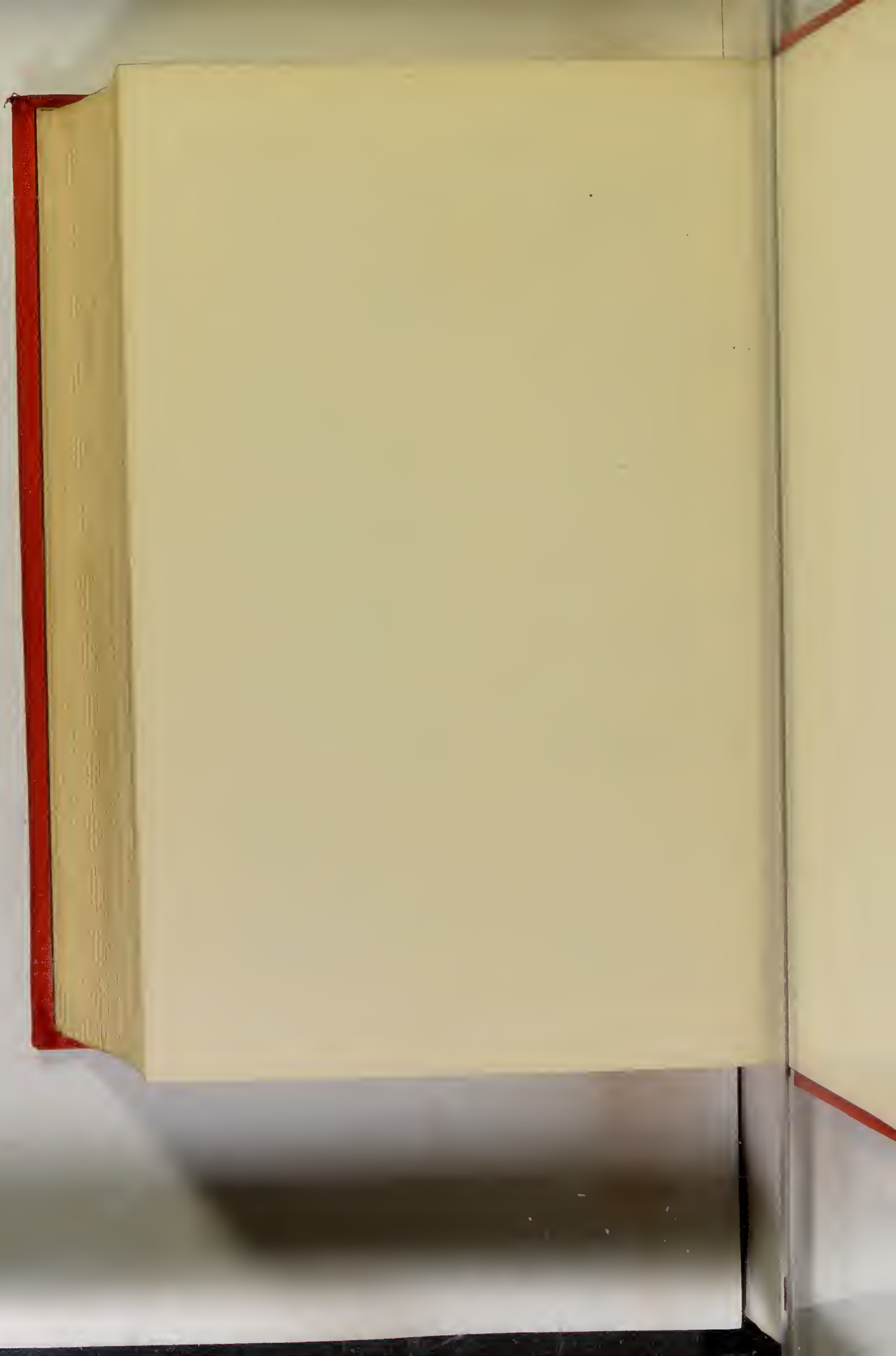
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